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March 30th, 1945
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Carrington Kenny

The threatened Interior Department attack on California's title to her tidelands has boomeranged with such force as to rock the advocates of Government ownership back on their heels.

While the "imminent" action promised by Secretary of the Interior Ickes in forcing a court test on the issue of "who owns the tidelands?" is still pending, at this writing, Congressional reaction against any such challenge of State's rights took a sudden upward swing, and a surprisingly large number of representatives in both Houses rallied to California's support. Resolutions "quieting" the titles of the States to their tidelands are still pouring into the hopper; State delegations are meeting with oil experts to map a campaign through which they hope to protect forever the rights of the several States to the lands lying between their high water mark and the maritime limit of three, or more, miles out to sea; Chairman Pat McCarran (D., Nev.) is appointing a subcommittee to his powerful Senate Judiciary Committee to hold hearings on the tidelands resolution he, personally, introduced.

Developments in the past 10 days have come with such a rush that observers are finding it difficult to keep up with each new turn of events.

The revelation that the Interior Department intends to apply whatever general policy it forms in connection with the California action to any other state where it can make a case, came as a rude shock to some states which had shrugged off Ickes' decision to grant one, or more, Southern California applications for drilling permits in the tidelands area as a "purely local" matter (see CALIFORNIA OIL WORLD'S 2nd Feb. issue). Ickes, himself, made the "general policy" statement at a press conference on March 8.

Arrival in Washington of William W. Clary, Los Angeles attorney who was specially-deputized by California's Atty. Gen. Robert W. Kenny as an assistant attorney general to handle the tidelands matter in the East, gave an added impetus to the Congressional campaign. The Californian came to the Capitol after prolonged discussions in Austin, Tex,. with Gov. Coke R. Stevenson and the Attorney General and Lands Commissioner of the State. . . . At that time, the Texas Congressional delegation was apathetic about the tidelands issue, but State officials already had begun to worry.

An epidemic of tidelands jitters broke out in Congress soon after the arrival of Clary and a group of well-known California oil men.

Much attention was given a joint resolution which, in effect, amounted to a quitclaim on the part of the U. S. to title to the tidelands, but the Californians wanted the legislation drafted in a manner which would be acceptable to the other states. (For example, the definition of "land beneath tidewater" had to be broadened to include the varying boundary lines of the Gulf and South Atlantic States, which extend, according to their claims, as much as 10 miles to sea).

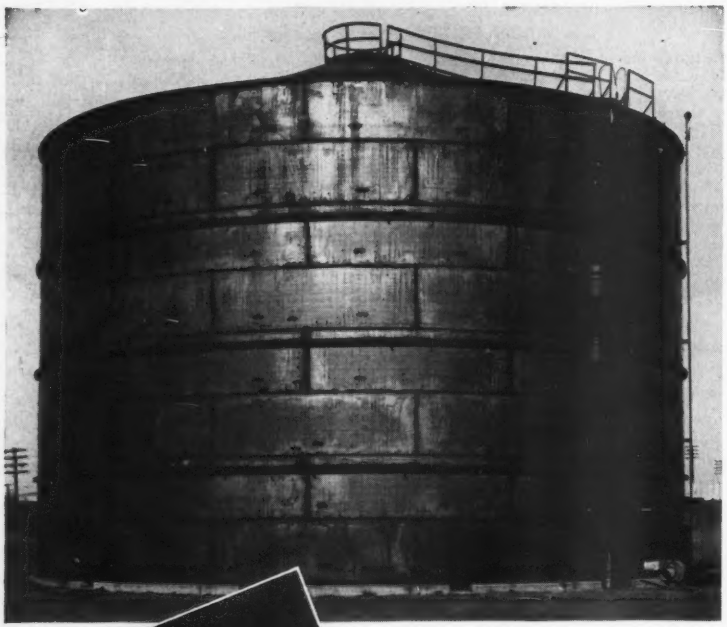
The California State executive and his colleagues conferred for several days with members of Congress from the coastal states and with House and Senate leaders; long distance telephone conversations were held with Attorneys General in numerous States and plans were laid for an effective presentation to Congress of the tidelands problem.

While the huddles at the Capitol were still in progress, Representative F. Edward Herbert (D., La.) threw the Californians into a momentary panic by introducing a tidelands resolution without waiting for the outcome of the consultations. The Louisianan acted on a letter from Gov. Jimmie H. Davis of that State, enclosing the "suggested resolution" and urging action on a matter about which "all states with coastal waters are disturbed . . . feeling it is an invasion of States' rights".

Since the Herbert resolution was virtually identical with the one drafted by Clary (undoubtedly, it reached the Governor of Louisiana immediately after the Texas conferences, where it figured prominently) the general reaction among the Californians was one of real satisfaction . . . Herbert is well thought of; represents a state far-removed from the Pacific Coast and the spontaneity with which he acted was

NEW WIGGINS PISTON BALLOON

. . . provides the petroleum industry with an efficient means of reducing evaporation losses from groups of existing cone-roof tanks storing volatile liquids.



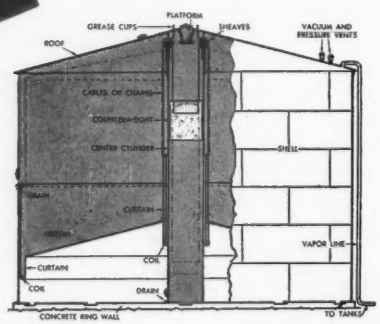
This Wiggins Piston Balloon above serves thirteen tanks having a total capacity of 415,000 bbls. The interior view at the left shows the piston in high position. The gas storage space in the new design is above the piston instead of below it. This makes it possible to inspect the underside of the piston and the sealing curtains without taking the balloon out of service.

The new Wiggins Piston Balloon is equally efficient for both large and small installations. Write our nearest office for full details and complete information on this newly designed vapor-saving device.

The new Wiggins Piston Balloon consists of a steel tank or shell with a cone roof, inside of which there is a counterweighted piston that moves *down* and *up* as the gas flows *in* and *out*.

The large photo at the left shows a new 150,000-cu. ft. Wiggins Piston Balloon at an aviation gasoline plant. It is connected to the vapor spaces of three 80,000-bbl., five 25,000-bbl. and five 10,000-bbl. tanks storing finished aviation gasoline. The vapor-saving system thus formed operates on the basic principle that no vapor loss will occur as long as vapor is not permitted to escape. The balloon has sufficient capacity to eliminate all venting under normal operating conditions. When temperatures rise and the air-vapor mixture above the surface of the gasoline in the tanks expands, the excess flows through the vapor lines to the balloon. When temperatures fall, vapor is reabsorbed at the liquid surface and the contents of the balloon return to the tanks. Thus, breathing losses are prevented.

During filling and emptying, air-vapor mixture displaced in one or more tanks by filling flows through the vapor lines to tanks being emptied. This balancing prevents most of the pumping losses.



Left: this sectional drawing shows some of the construction features of the Wiggins Piston Balloon. The piston is approximately 1½ ft. less in diam. than the shell and is supported from a central cylindrical column by cables that pass over sheaves at the top of the column and are attached to a counterweight on the inside. The space between the outer edge of the piston and the shell is closed by means of a flexible curtain or seal which is connected to the shell at mid-height and is long enough to permit the piston to travel to the top and bottom of the balloon. A similar curtain is used to close the space between the inner edge of the piston and the center cylinder.

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genuine proof of a growing appreciation in the Southeast of the seriousness with which the pending Ickes action is regarded.

Jumping on the bandwagon, immediately after the Herbert resolution was introduced, March 12, were numerous other members of Congress who dropped in similar measures to indicate their interest in the tidelands matter. Reps. Doyle (D., Cal.); Tolan (D., Cal.); Celler (D., N. Y.); Boykin (D., Ala.) and Bender (R., Ohio) all had "quieting" resolutions before the House within 48 hours. Senator McCarran was the first from the Upper House to sponsor the legislation,—submitting a Senate resolution identical to the Herbert bill, except that it dispensed with all the preliminary "whereases."

While Congressmen probably will continue to crank out legislation reaffirming the title to the tidelands is vested in the several States while CALIFORNIA OIL WORLD is going to press, there is a general feeling the commotion will not reach its crescendo until Ickes actually issues the California permit,—or permits. At least two applicants—C. P. Ritter, president of Consolidated Petroleum Co., and his partner, William Chapin—are in Washington awaiting the final verdict.

Ickes, meanwhile, upset the City of Long Beach and the California oil industry by announcing a change-of-heart on the subject of back royalties. In a second interview with Representative Clyde Doyle—leader of the House fight to protect California's tidelands, and a Long Beach attorney with considerable knowledge of the tidelands situation—Ickes took back his former assurances that the United States was not interested in royalties, Doyle told CALIFORNIA OIL WORLD. The Interior Secretary previously assured the Californian the State, municipalities, oil companies and others with tideland leases need not be concerned over the royalty problem, as no court would hold the lessees should be penalized for recovering oil in the belief the land did not belong to the Government.

The impact of any gesture in the direction of past royalties upon new development, and even upon operators currently producing from tidelands properties, can be readily appreciated. According to Assistant Atty. Gen. Clary production definitely will be retarded when Ickes, by granting the California permits, throws the tidelands matter into litigation.

States such as Mississippi, Louisiana and others with relatively new tidelands discoveries naturally are deeply concerned. Many States have recently leased large properties (such as the Mississippi lease of 400,000 acres to the Kerlyn Oil Co. and large tracts in Alabama, Louisiana and Florida).

To expect the lessees to start drilling at a time when California's right to title of her tidelands is being explored by the courts would be tantamount to a slur on the hardheadness of the petroleum industry. The oil business is risky enough under normal conditions. . . . Regarding operators who already are recovering oil from tidelands leases, the question arises as to whether they would want to take a chance on possibly having to double the ante by paying the Federal Government royalties already paid the State.

Although Ickes first made known his intention to accept a filing, or filings, in the Long Beach-Seal Beach area early last month, the Interior Secretary has been remarkably coy since making his announcement. Despite almost daily reports the applications would be granted "tomorrow" or "before the end of the week", no word has yet come from the Interior Department that the action has been consummated.

Numerous observers are betting that Ickes is waiting until Congress folds up for the traditional recess (no date has been set, at this writing, for the Easter holiday; some members predict a lay-off from March 23 to April 10, and others favor short three-day recesses with business sandwiched in between) before he pulls the plug on the California permits. Reports that the unusual interest displayed by Congress in the tidelands ownership question has frightened the Secretary away from his original purpose of a court test are generally discounted,—because Ickes does not frighten easily.

Perhaps the most alarming theory for the stalling on the part of the Interior Department is the recurring rumor that the Department of Justice is preparing a suit against the State of California (a suit that would originate in the Supreme courts' thus eliminating the necesity to force action in the lower courts through the method Ickes proposes to use.

Asked if the Justice Department was working on such a suit, Solicitor General Charles Fahy hastily protested "Oh, I wouldn't say that!" Fahy refused to discuss the matter, however, referring this writer to Attorney General Francis Biddle.

It is not customery for the Department of Justice to discuss such problems, Biddle told CALIFORNIA OIL WORLD. The Attorney General recalled that talk about a Justice Department suit to establish title in the tidelands in the United States had been "going on for five years". The Cabinet officer expressed surprise, however, when told about Ickes' stated decision to grant the California applications,—indicating he had not been informed of the situation.

Although the legal profession is generally confident that more than a century of precedent backs up in every way the claims of the respective States to their tidelands properties, prospects of a suit by the Department of Justice are not welcomed by those who are fighting to protect States' title. One major reason for this appears to be the make-up of the present U. S. Supreme Court and the record it has made reversing earlier decisions of the Highest Tribunal. . . . The confidence of some attorneys has been shaken considerably by recent Supreme Court back-flips.

Liveliest fight against Federal encroachment probably will be made by the McCarran subcommittee which, at this writing, has not yet been appointed. The Nevada Senator has shown an unusual interest in the tidelands matter and promises hearings "reasonably soon" to thresh out the entire problem.

In the House, Rep. Doyle has been joined by numerous California colleagues in his campaign to awaken the country to the overall threat embodied in Ickes' attack on Cali-

(Continued on page 36)

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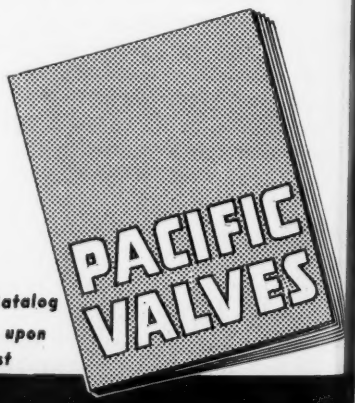

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Avon Refinery of Tide Water Associated Uses Many Processes in Manufacturing 100 Octane

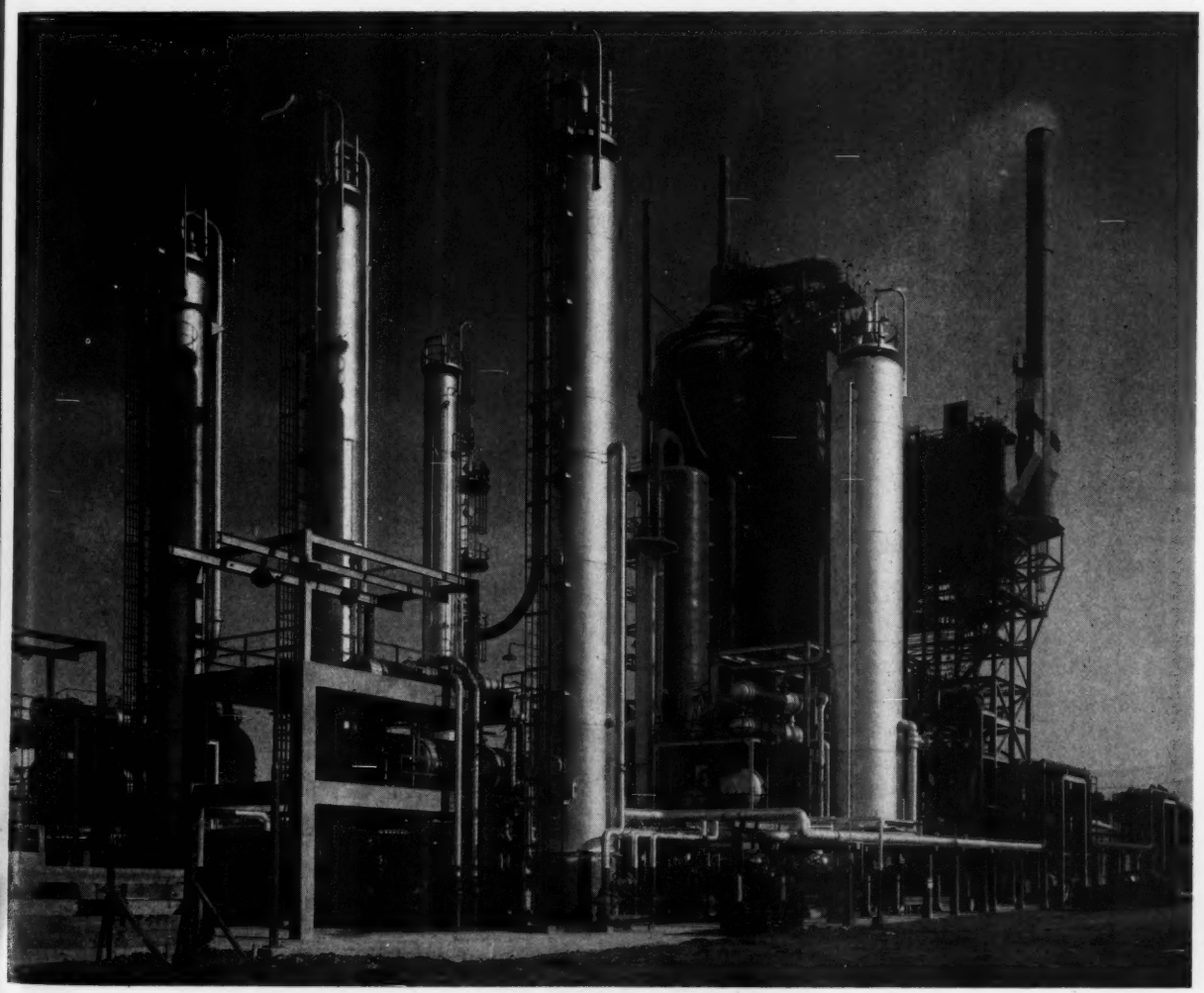
By C. K. VILAND,
Supervisor of Development
Tide Water Associated Oil Co.
Western Division,
Associated, California

Present day aviation engines require specialized fuels. Such fuels must contain those types of hydrocarbons having desirable combustion characteristics which fall within the boiling range permissible in aviation gasolines. By present standards virgin gasoline distilled from crude oil is not a good fuel for high power aviation engines, and during recent years petroleum fractions have been chemically converted by ever improving processes to better products from the standpoint of utilization in high compression aviation engines. One hundred octane is the present standard for manufacture of aviation gasoline in the United States.

100 octane gasoline is a fuel which, when run in a test engine, matches the anti-knock quality of chemically pure iso-octane (2-2-4 trimethyl pentane, one of seventeen possible iso-octanes). Aviation gasoline of 100 octane number is usually commercially produced as a blend of several ingredients, as shown in Figure 1. It is customary to consider these in three classes, namely, the blending agents, including materials of higher quality than the average composition of 100 octane gasoline, the base stocks, or hydrocarbons of lower octane rating than the average of the blend, and tetraethyl lead, an additive which raises the anti-knock quality of all the hydrocarbon components and thereby permits inclusion of larger amounts of base stocks in the 100 octane blend.

Avon Refinery—General

The Avon Refinery of Tide Water Associated Oil Company is located on the upper arm of San Francisco



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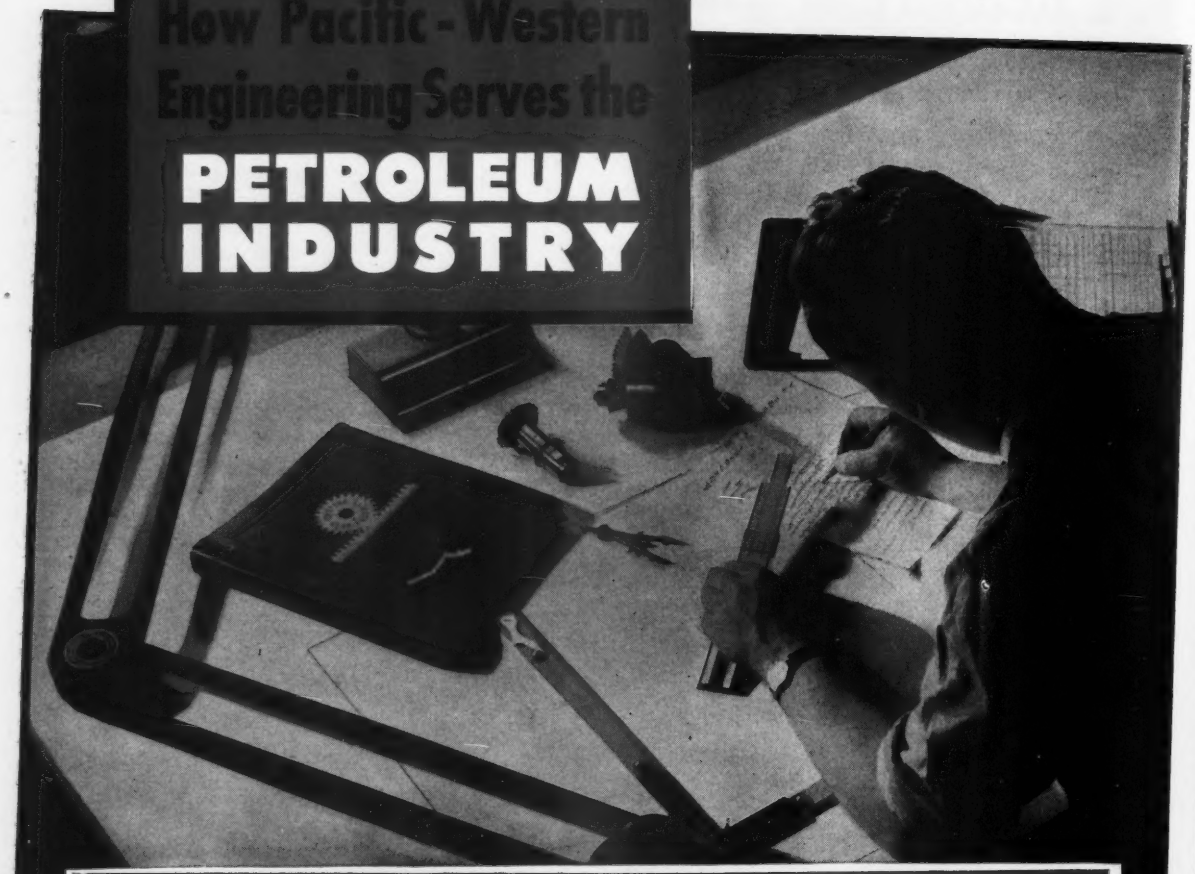

For Example

It was 26° below zero in Powell, Wyoming, when this picture was taken of a Pacific C-52LFO-25 Pumping Unit at work in the field. Unit has an especially long base so the gas engine can be enclosed to keep it warm. This is typical of the special adaptations Pacific-Western engineers make to assure that P-W equipment gives the maximum of performance, efficiency and long-life with minimum repairs and replacements.

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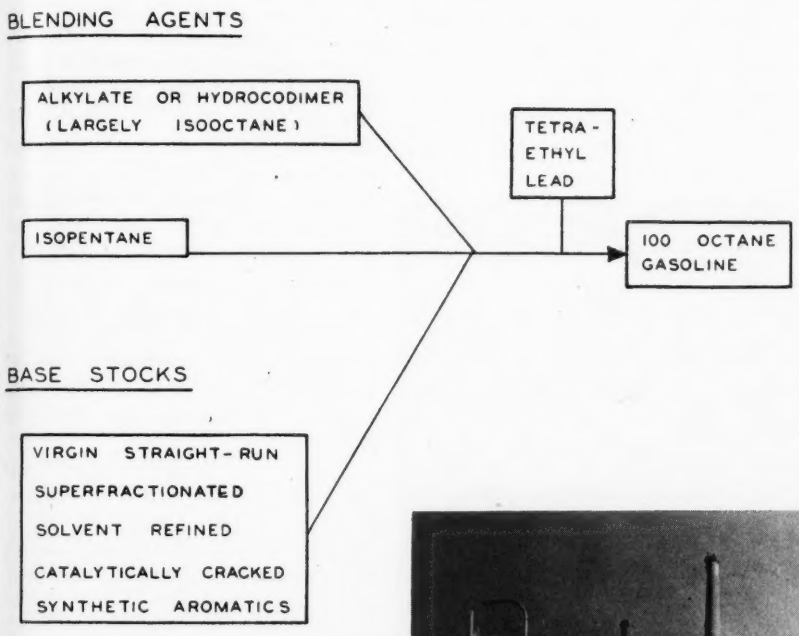
PACIFIC WESTERN GEAR PRODUCTS

FIGURE 1 AVIATION GASOLINE MANUFACTURE



Bay in California and is situated about four miles from Martinez and thirty-five miles from San Francisco. It occupies an area of some 1444 acres and has ample dock facilities to load or unload ocean going tankers.

The Avon Refinery was one of a small number of plants producing 100 octane aviation gasoline before the war. Such aviation gasoline has been produced continuously since the completion of a sulphuric acid alkylation plant in June of 1940. New facilities recently placed into operation at Avon include the world's largest single Fluid catalytic cracking plant, first placed on stream December 29, 1944, a pentane isomerization plant, the first of its type ever to be constructed, and further extensions to the alkylation plant. With the successful operation of new refining facilities present day production of 100 octane gasoline is well over fifteen times that in 1940.

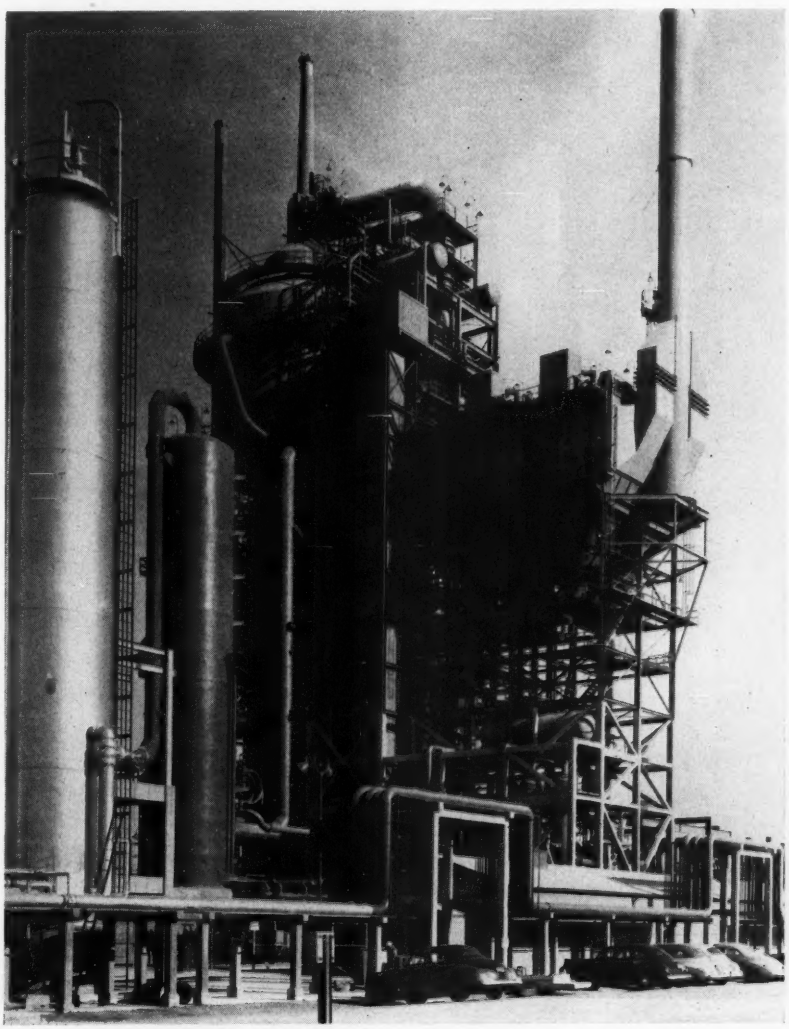
Aviation gasoline manufacture in this refinery utilizes a combination of processes which permits a maximum of flexibility in operation. In addition to the new facilities, the operation of all other refining units has been changed or affected by the pressing demand for increased quantities of aviation gasoline. The production from the older refining facilities which existed before the war has been an important contribution, and without them the present large production of aviation fuel and other war petroleum products would not have been possible.

Crude oil is received into the Avon Refinery largely by pipelines from the oil fields of the San Joaquin Valley. Natural gasoline is transported to Avon by tankers from the company's production at Ventura and from other gasoline pipeline terminals at tidewater.

Processing Aviation Gasoline

In manufacturing aviation gasoline, the Avon Refinery carries out the following operations:

Distillation of light crude oil to obtain gasoline, residuum, and in-



termediate fractions. The intermediate distillates form part of the charge to the catalytic cracking unit. This operation is carried out in a conventional battery of stills and fractionating towers. The straight run gasoline from the crude stills and also the natural gasoline are charged to the superfractionation unit, which in effect sifts out the high octane components. The products from this unit are aviation base stocks, Isomerization Plant feed stocks, and solvent refining charge stocks.

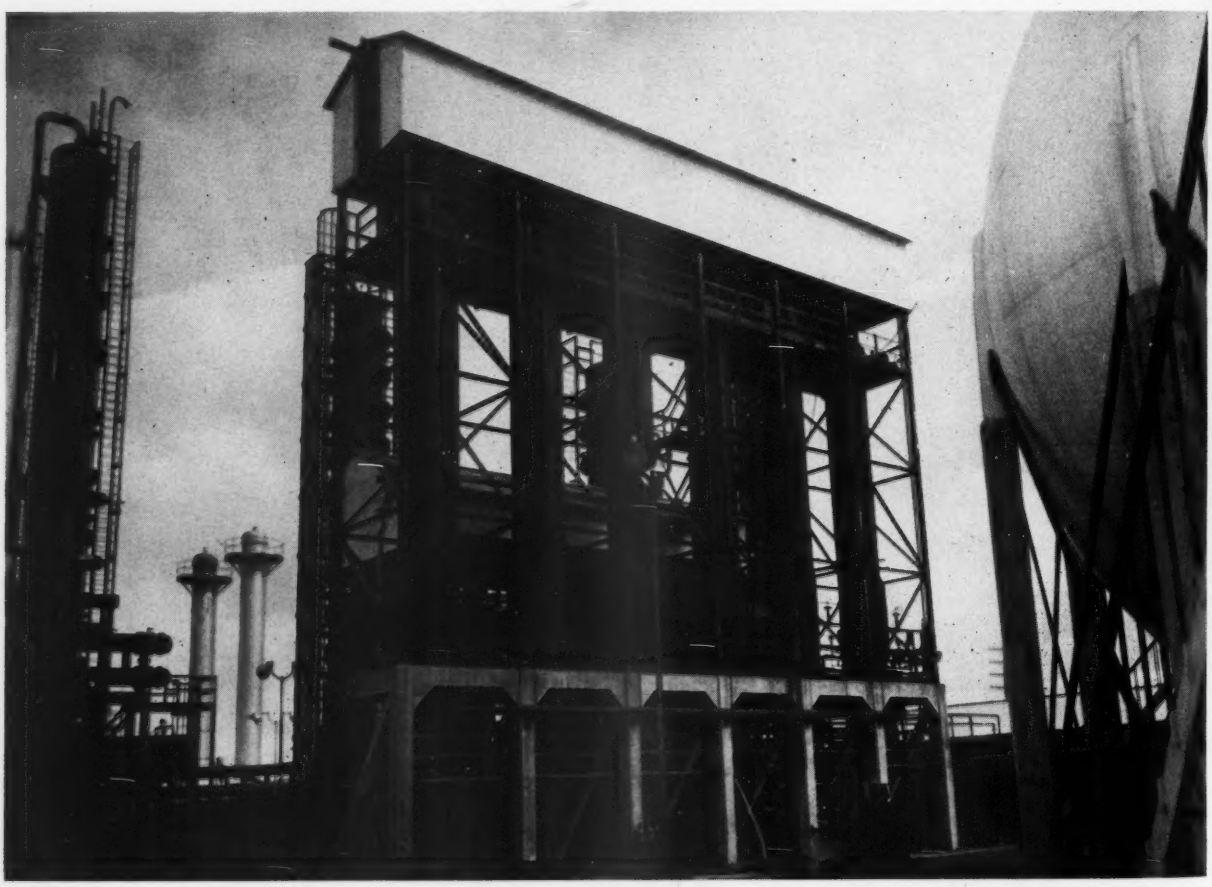
The Avon superfractionator consists of a battery of nine tall towers having from 36 to 70 bubble cap trays per tower. Although designed to separate narrow cuts of the isomers up to and including isoheptane, this unit often serves as a general purpose gasoline fractionator. For example, at times as many as three fractionators are employed in parallel separating isopentane from normal pentane. Under these conditions the superfractionated virgin base stock usually consists of a closely cut fraction containing isohexane, normal hexane,isoheptane, and other associated hydrocarbons naturally present in crude oil.

The heavier straight run naphthas produced by superfractionation are subjected to solvent refining to produce additional aviation base stocks rich in aromatic hydrocarbons. The Avon solvent refining plant is one of the first commercial units to have been installed in the United States. It was constructed in 1924 using sulphur dioxide as the solvent. A number of process changes have been made so that at the present time its throughput capacity is approximately eleven times the original design. The aviation base stock produced in this unit is similar in many respects to the intermediate cut of catalytically cracked gasoline.

The low octane raffinate from the solvent refining operation is thermally reformed, primarily to produce light olefins for alkylation feed and also charge stock for aviation base stock production by Fluid Catalytic Cracking. A good example of war time use of existing facilities is the use of the Avon Number Two Thermal Cracking Unit as a reforming unit to process this raffinate. This plant is being pressed at severity almost unheard of in pre-war days, operating at transfer line temperature of 1110° - 1135° F. and producing 7 volume percent of butylenes based on the feed stock on a once-through operation. Surprisingly enough, runs of 100 days are now not uncommon in this unit.

Cracking operations at Avon include thermal cracking of reduced crude and gas oils and thermal polymerization of refinery propane fractions, all under conditions suitable for production of alkylation feed stocks.

In the new Fluid catalytic cracking plant gas oils and thermally reformed naphthas are processed under severe conditions in the presence of synthetic catalyst with the emphasis on the production of maxi-



Butane Isomerization Plant

mum quantity of alkylation feed stocks and maximum quality of gasoline, a large portion of which is used as aviation base stock.

Both the depentanized light catalytic naphtha boiling up to approximately 200° F. end point and the intermediate catalytic naphtha boiling in the approximate range of 220° -340° F. are being acid treated commercially using about 15-20 pounds of spent alkylation acid per barrel of naphtha. The treating is done in two counter-current refrigerated treating plants at a temperature of about 60° F. The treated light and intermediate catalytic naphthas are neutralized and rerun separately to remove the polymers formed from the lower octane olefins, leaving substantially only the higher octane isoparaffines and aromatics as the finished catalytic aviation base stock.

The Avon Alkylation Plant has six pump and time-tank propane refrigerated reactor units, two of which process feed stocks containing isobutane and amylenes as the major reactants. Four reactor units produce alkylate from isobutane, propylene, and butylenes. Of the olefins now alkylated, the butylenes and amylenes are produced by both thermal and catalytic cracking and the propylene from catalytic cracking only.

In order to increase the supply of isobutane for war-time alkylation requirements, a vapor phase isomerization plant was constructed. This plant charges normal butane through a reaction zone containing Isocel catalyst, of which the active ingredient is aluminum chloride. Anhydrous hydrogen chloride is used in the process as the reaction promoter. A high service factor is obtained in this plant, since it has six individually controlled tubular heat exchanger type reactors and two hydrogen chloride strippers.

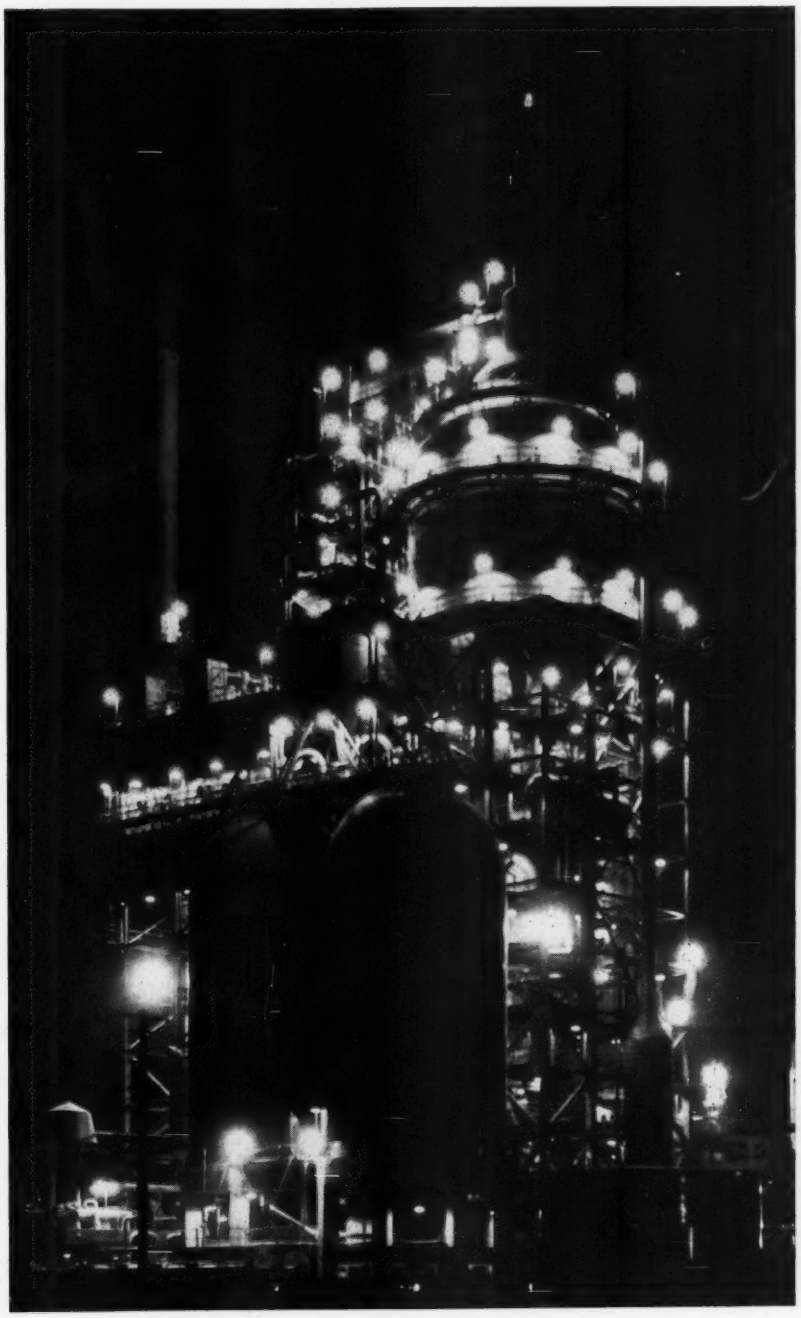
The Pentane Isomerization Unit of Tide Water Associated Oil Company is the first plant of its type ever to be constructed. This plant synthesizes isopentane, an important ingredient of aviation gasoline, from normal pentane. A liquid catalyst is employed, of which the active ingredient is aluminum chloride. The reaction is controlled by proper use of reaction promoters and suppressors, including hydrogen and hydrogen chloride.

All of the aviation gasoline components produced at Avon are blended in the refinery into 100 octane gasoline meeting government specifications. Other stocks, such as cumene and toluene, are also blended from time to time as they become available.

Processing Other Products

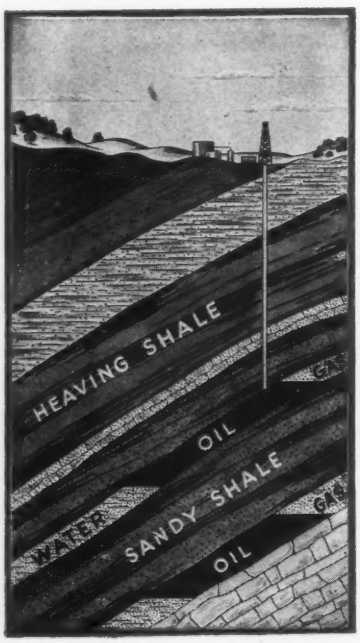
Motor gasolines at Avon are produced largely from thermal cracking. Smaller quantities of naphtha from catalytic cracking and straight run gasoline fractions not used in aviation gasoline are blended into domestic and military motor fuels.

Over two-thirds of the capacity of the solvent refining plant is required in the manufacture of aromatic aviation base stocks and aromatic solvents. The balance of its capacity is



Catalytic Cracking Plant at Avon Refinery.

Nature's *Self-Sealing* Oil Tank



Heaving shale can completely wreck drilling operations unless controlled by this effective method.

LIKE the self sealing layers around a bullet proof gasoline tank, heaving shales above an oil formation may "self seal" the oil deposits beneath to the extent of making them undrillable by ordinary methods.

Made unstable by hydration such shales ordinarily swell and slough into the well bore so as to force abandonment of the well, often with loss of part of the drill stem and sometimes the lower part of the casing string.

The sodium silicate method of heaving shale control, developed by Texaco, checks this hydration, keeps the shale stable and permits penetration of heaving shale and exploration and development of sands and oil below.

It is now being used by many major oil companies in the Gulf Coast area.

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used for finishing kerosenes, lubricating oils, transformer oils, spray oils, cosmetic oils, and specialty products.

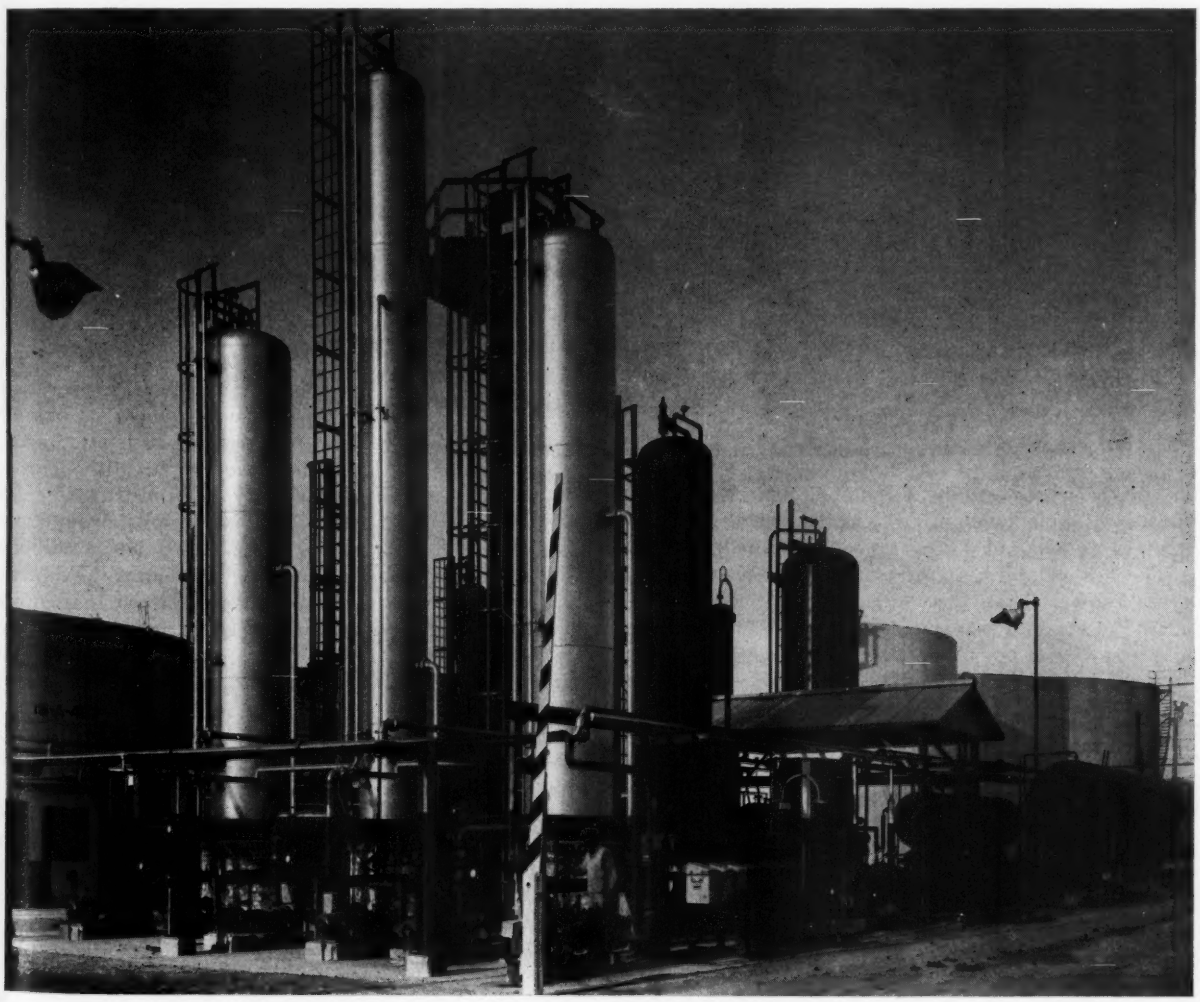
Asphalts and road oils are produced as by-products in the distillation of heavy crudes under vacuum during the manufacture of lubricating oils. Lubricating oils not finished by solvent refining are acid treated.

Domestic heating oils and diesel fuels are largely selected straight run fractions from the crude stills. Navy and industrial fuels are produced as the residues from cracking operation. One of the Avon thermal cracking units is specially designed to produce low-pour fuels from waxy crude bottoms through recracking a waxy distillate obtained from processing the visbreaker bottoms under high vacuum.

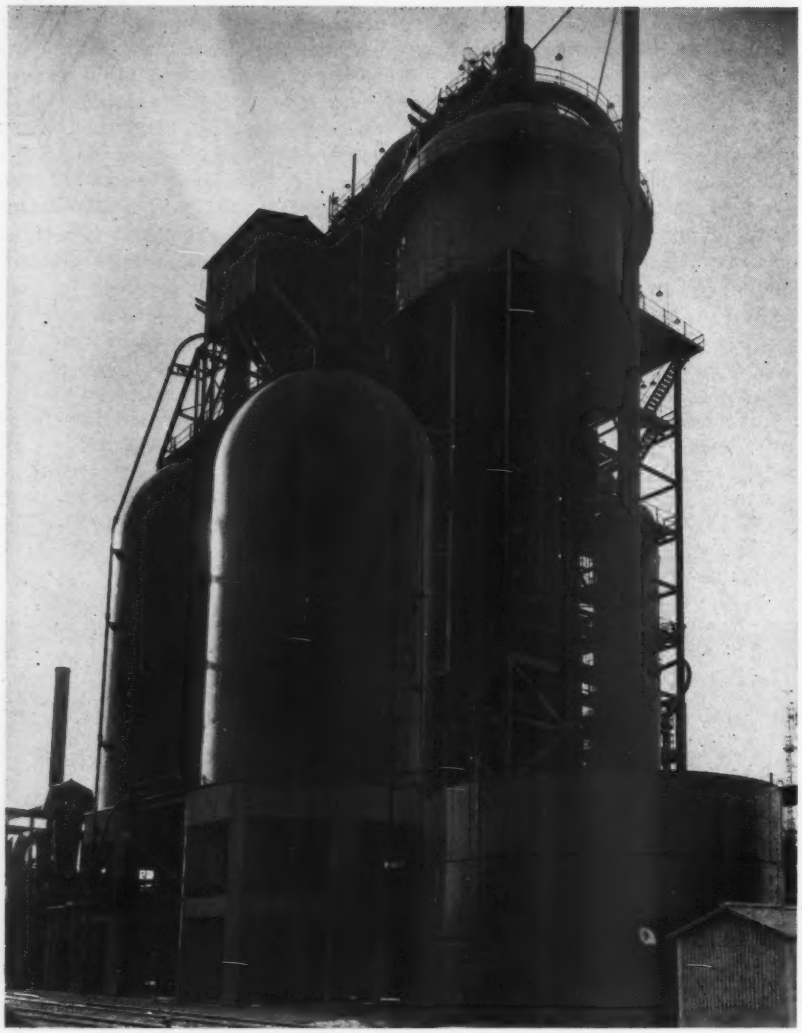
New Fluid Catalytic Cracking Plant

A major installation is the Fluid catalytic cracking plant, which has a design capacity to charge 16,000 barrels per day of gas oil while cracking 72% of the charging stock into gasoline and lighter fractions in a single pass through the reactor unit. The ability of the plant to circulate catalyst between the reactor and regenerator vessel is in excess of 40 tons per minute, with coke burning capacity in the regenerator in excess of 16,000 pounds per hour. These severe cracking conditions make it possible to produce high yields of light isoparaffines and olefins for alkylation feed stocks and at the same time produce a gasoline rich in isoparaffines and aromatic hydrocarbons which is finished by sulphuric acid treatment.

Commercial catalytic cracking of petroleum is a comparatively recent development, the first commercial plant to employ the Fluid Process having been completed in 1942. In its simplest form, catalytic cracking requires a catalyst to promote the reaction and some means of contacting the oil with catalyst. During the reaction the catalyst becomes fouled with carbonaceous material, which deposit is removed by combustion with air. In the Fluid Process a moving catalyst is used, with the reaction taking place in one vessel and the regeneration of the catalyst in a separate vessel. The Fluid Process takes advantage of the chemical engineering technique wherein powdered solids, such as powdered catalyst, are handled as a fluid by aeration with air or oil vapors. This produces a freely mov-



Caustic washing facilities prepare alkylation feed stocks produced in new Catalytic Cracking Plant for further processing at Avon.



New Fluid Catalytic Cracking Plant at Avon is world's largest.

ing mass which can be circulated through the plant much in the same manner as a liquid.

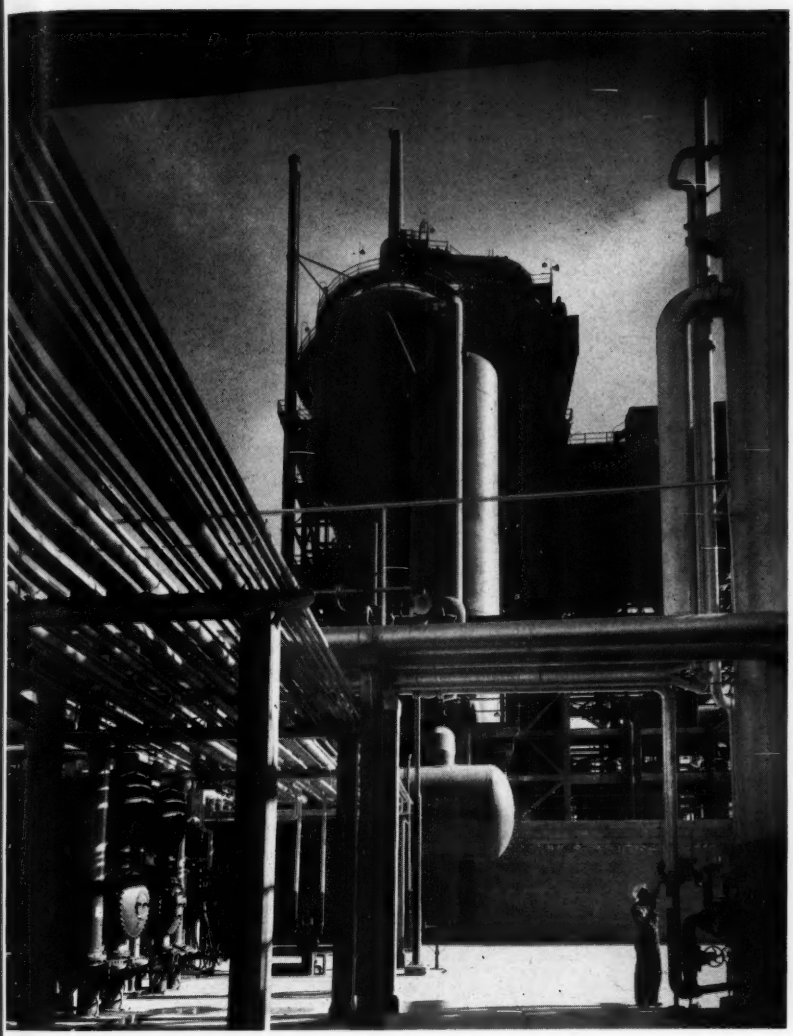
The first catalytic cracking of the type known today may have occurred in a minor way incidental to clay treating of petroleum fractions. It is now generally known that many of the clays used for treating have some cracking activity. Of these clays, one type, known as Bentonite, forms an active catalyst after having been treated with an acid. Montmorillonite, a non-swelling Bentonite, has been used widely and is a hydrosilicate of aluminum with a well defined crystal structure. This is the type of catalyst used in all early catalytic cracking, being formed into pellets for use in the Houdry static bed process and the Thermofor moving bed process, and used as a finely ground powder in the case of the Fluid Process.

Research in catalytic cracking has led to the development of a synthetic cracking catalyst having a chemical composition similar to that of the clays, but which is more active and more stable at high temperatures than catalyst from natural sources. In addition to proper chemical composition, a cracking catalyst must be highly porous, and large surface area of these pores is important. A single pound of good cracking catalyst has approximately 50 acres of such surface. It is known that without this surface the white powder ceases to be a catalyst even though the chemical composition remains unchanged. The Avon Plant uses a special finely ground synthetic catalyst manufactured by the American Cyanamid and Chemical Corporation.

In the Avon Fluid catalytic cracking unit no furnace is needed for preheating the charge oil. The oil reaches the temperature required for the reaction from heat imparted to the moving catalyst in the regeneration step. After combustion, catalyst at about 1050° F. or higher temperature flows from the regenerator into the reactor riser pipe where it is contacted with the fresh oil charge which has been preheated to approximately 400° F. through heat exchange. The oil, which is substantially completely vaporized instantly upon contact with the hot catalyst, passes into the reactor vessel where a suitable bed depth of fluidized catalyst is maintained.

The Avon reactor is unusually large, dimensions of the cylinder portion being 27′ in diameter by 54′ high on the straight side, which with a 45° cone top and bottom provides ample capacity for maintaining high cracking intensities at design or higher charging rates. The bulk of the entrained catalyst in the oil vapors passing out of the reactor is recovered in the Multiclone Unit and returned to the system. The cracked oil vapors are charged to the 17′ 6″ x 89′ fractionating tower, where separation of the catalytically cracked products is obtained. Both the reactor and fractionator are alloy lined to permit operation on a variety of feed stocks. The spent catalyst drops through the reactor past the inlet distributor grid section and into the bottom cone which serves as a stripping section to remove entrained oil vapors by steam purging before the catalyst is transferred into the regenerator vessel. At the bottom of the reactor standpipe a slide valve is provided which regulates the flow into the 92″ regenerator riser pipe. This line has no horizontal sections. The upsweep bend is constructed of bare carbon molybdenum steel, and Insidline construction is used in the vertical section.

The regenerator vessel has an effective diameter of 46′ and a cylinder height of 30′ after allowing for the space occupied by the Bigelow-Lip-



A portion of the new Fluid Catalytic Cracking plant at Avon.

tak refractory lining. The regenerator vessel also has a 45° cone top and bottom, and is equipped with a Meehanite distributor grid and two regenerated catalyst draw-offs, one for the regenerated catalyst return to the reactor and the other for the recycle catalyst steam generator exchangers, which act as a temperature controller. The flue gases leaving the bed of fluidized catalyst in the regenerator pass through Multiclones and through twin waste heat boilers and into the Cottrell precipitator units, which are operated at substantially atmospheric pressure. These units recover catalyst fines from the flue gas before it is released to the atmosphere.

Feed Preparation Unit

In order to augment the supply of virgin gas oil from the Avon crude distillation units, a vacuum feed preparation unit was built and is operated in conjunction with an existing thermal viscosity breaking unit. Straight run residuum from the crude stills, containing waxy gas oil, is charged through heat exchange on the viscosity breaking unit into a new 50,000,000 Btu per hour fired tubular heater designed to operate at transfer line temperatures of up to 690° F. The transfer line enters the bottom section of a vacuum tower which is 24′ diameter and 22′ high on straight side. It is designed to operate at 50 mm. mercury absolute pressure in the flash section. This vacuum tower is provided with four specially designed fractionating trays and has a design charge capacity of 25,000 barrels per day of residuum, with the ability to take overhead 10,000 barrels or more per day of well fractionated oil. This product forms part of the charge to the new Catalytic Cracking Plant, and the heavy residuum bottoms are thermally cracked in the adjacent two stage viscosity breaking unit.

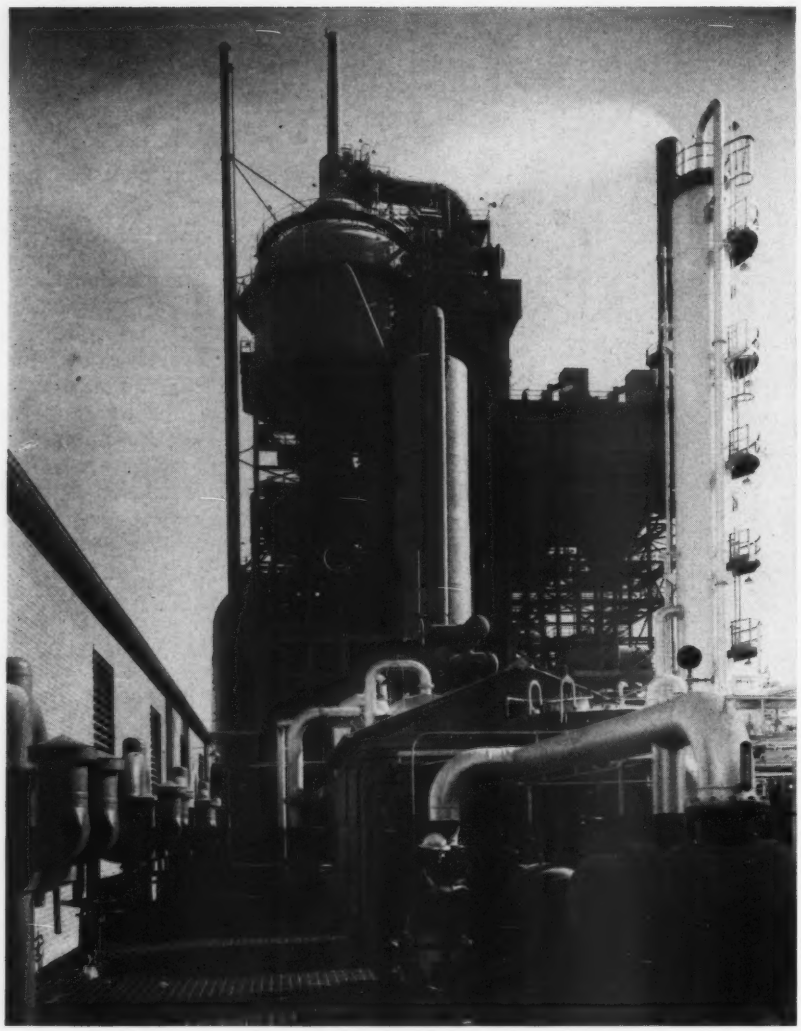
Gas Recovery Stabilization Unit

The gas recovery stabilization unit provided for the new Catalytic Cracking Plant processes both the liquid and the gas products from the main fractionating tower. Five 800 horsepower Clark compressors take suction on wet gas from the distillate condenser at substantially atmospheric pressure, raising the pressure to approximately 40 pounds gauge in the first stage of compression.

A feature of novelty in the Avon Gas Recovery Plant is the provision of a water wash tower to cleanse the gas after the first stage of compression and also the raw gasoline from the main distillate receiver in an 84″ by 24 tray column. This provides the ability to process gas oils which might be high in nitrogen compounds, removing products of cracking which may affect efficient operation of the gas plant towers. Each engine is provided with both low and high stage gas compression cylinders so that each compressor is a self-contained unit.

The washed gas is picked up into the suction of the second stage cylinders and boosted to a pressure of 175 pounds gauge, where it enters a 40 tray absorber-demethanizer column. The raw gasoline from the water wash tower bottoms enters the lower section of the absorber-demethanizer, and sufficient absorption oil is circulated over the top of the tower to recover 70% or more of the propane-propylene fraction and substantially all the heavier hydrocarbons. An intercooler is provided near the center of the absorber, and the bottom section is provided with a reboiler to eliminate as much methane and ethane as possible from the rich absorption oil before further processing.

The rich oil is charged into a 30 tray still, where an overhead fraction of about 200° F. end point is recovered. This fraction is charged



Another view of the Fluid Catalytic Cracking Plant.

into a 40 tray depropanizer tower, taking overhead the propane - propylene cut which is further processed for hydrogen sulphide removal in a Girbotol Purification Unit. The bottoms from the depropanizer tower are charged into a 40 tray debutanizer - depentanizer tower for recovery of alkylation feed stocks, and light catalytic naphtha is removed as the bottom product.

The bottoms from the still, comprising the material largely in the range of 200° - 400° F., are split into two streams, part going to the absorber demethanizer as absorption oil and part to a 30 tray splitter column where a 200° - 340° F. aviation naphtha cut is taken overhead, and heavy motor naphtha removed as the bottom product.

All of the new facilities were constructed by C. F. Braun and Company as Tide Water Associated's contractor. The butane and the pentane isomerization units are operated under license from Shell Development Company. The Fluid catalytic cracking unit is licensed by Universal Oil Products Company, who furnished process engineering and cooperated with Braun's and Tide Water Associated's technologists in the design of the unit.

The unique combination of processes now operating at Avon is readily adaptable to fit future trends in the specifications of aviation gasoline and other petroleum products.

A.A.P.G. Establishes New Committee

What is expected to be a valuable contribution to the California oil industry is the work which has been started by the Classification Committee of the Pacific Section of the American Association of Petroleum Geologists.

This committee of geologists, at the suggestion of various oil industry groups has undertaken a reclassification and, where desirable, a renaming of California oil fields, oil pools and oil areas.

This committee is at present charged with the duties of formulating appropriate names for the new discoveries of oil and gas and is now cooperating with both the Division of Oil & Gas and the Conservation Committee of California Oil Producers in this capacity. In addition, the committee gathers statistics on wildcat drilling.

The members of the Classification Committee plan to interview oil operators, State oil and gas engineers and others interested in this problem of reclassification and will endeavor to establish a system of classification and names that will avoid confusion and furnish a more useful set of statistics for compiling and reporting data on California oil fields.

Members of the committee, their addresses and the territories assigned to them follow: Frank S. Parker, chairman, Petroleum Administration for War, 758 Subway Terminal Bldg., Los Angeles 13, "Los Angeles Basin"; Harvey Lee, Union Oil Co., Los Angeles 14, "Coastal District"; Robert W. Burger, The Texas Co., Bakersfield, "West Side of San Joaquin Valley and Northern California"; Mason L. Hill, Richfield Oil Corp., Bakersfield, "Central Valley and East Side Districts".

The names now in use for oil fields and oil areas just "grew up" with the individual localities, according to Frank S. Parker, chairman of the committee. Different organizations use different names and divide up oil fields in a different manner. He cited the example of the term "Sunset", which has been used for three separate fields in California, namely, the area near Taft, a portion of the Mt. Poso field northeast of Bakersfield and a small field now abandoned in Hopper Canyon in Ventura County.

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The Effect of Supercompressibility of Natural Gas Upon Compressor Performance

By
Robert S. Ridgway
Standard Oil Company of California

MARCH MEETING

The factors relating to the compression of gases consisting principally of methane at normal pressures have been well established and we have been able to predict the performance of compressors operating under these conditions with good accuracy. When pressures and temperatures are such that deviations from ideal gas laws exist, the effect is known as supercompressibility, and the operation of the compressor cylinder under such conditions must be thoroughly understood in order to predict the volume throughput and horsepower involved.

The effect of supercompressibility is very pronounced at high pressures and even with so called "dry" gases it may be worth recognizing at suction pressures as low as 200 pounds. With "wet" gas mixtures and those which are not principally methane, the effect is usually appreciable at low pressures. This discussion will be confined to performance at high pressures, though the methods presented are applicable to performance at any pressure if the factors are available. When we find a cylinder handling, in some cases, a throughput of 150 to 200% of that calculated neglecting supercompressibility, with a horsepower requirement in the same order of magnitude, we have a condition which we cannot afford to overlook. There seems to be some tendency to ignore the effect of supercompressibility upon compressor performance and to assume that discrepancies from this source can be neglected. It is the aim of this paper to point out the dangers of such a practice, to indicate the practical value of the proper treatment, and to present the methods of calculation which recognize this effect. Because this phenomenon is usually most pronounced at relatively high pressures, a discussion of it is very timely as repressuring and cycling operations come to the fore.

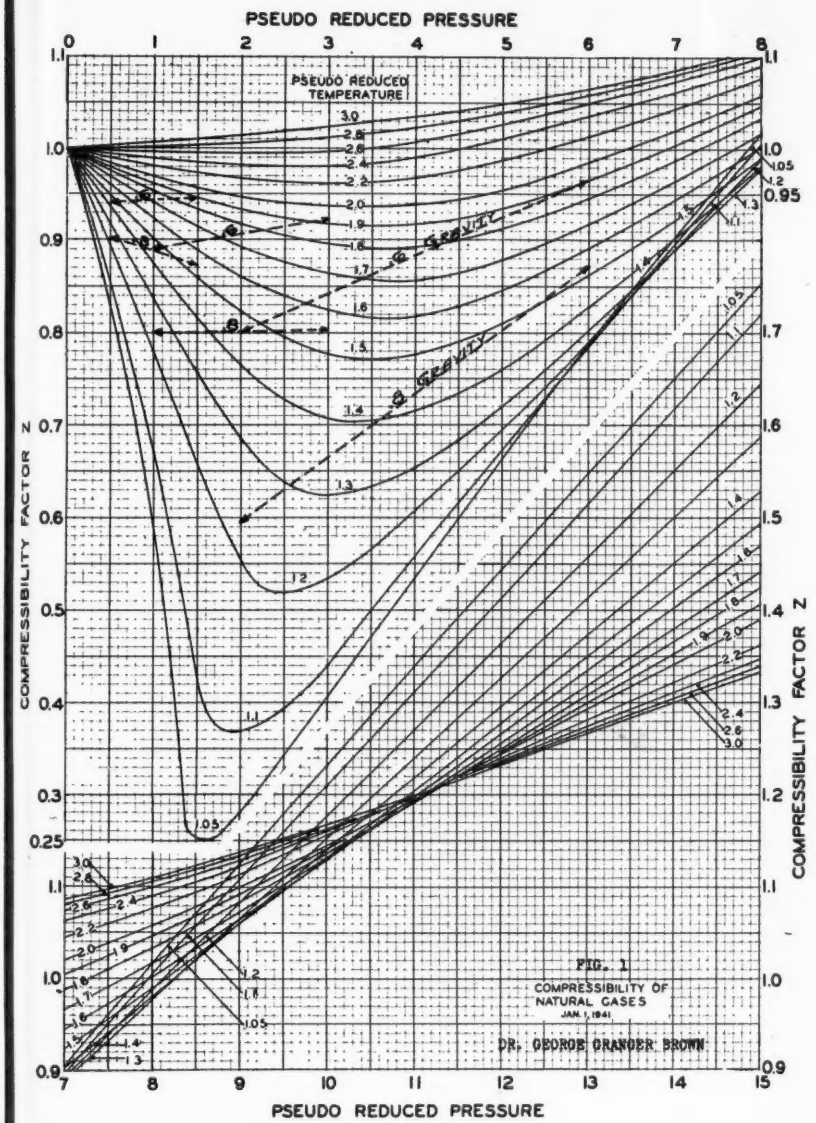
The Author

Compressibility Factors

Excellent papers and curves on the subject of Deviation of Natural Gas from ideal gas laws have been presented in recent years and are readily available. [1] [2] The methods of calculating compressibility factors have been adequately treated and need no review here, except, perhaps, to emphasize that the factor is a multiplier used in finding the volume occupied by a given weight of "deviated" gas from the volume occupied by the same weight of gas under ideal gas laws. Curves have been published showing compressibility, or "Z" factors for Natural Gases as a function of the pseudo-reduced pressures and temperatures. In figure 1 we reproduce those of Dr. G. G. Brown. [1]

For the gas being compressed it will be necessary to determine these compressibility factors at both suction and discharge conditions. Normally for any compressor problem we know the suction and discharge pressures and the suction temperature. At once the problem arises of how to determine the correct discharge temperature under conditions of supercompressibility. This can readily be approximated from Entropy-Enthalpy diagrams in which the deviation from perfect gas laws has been taken into account. Dr. Brown [3] has published a set of these curves covering natural gases of gravities between 0.6 and 1.0, through wide ranges of pressure and temperature. By his courtesy figures 2 and 3, for gravities 0.6 and 0.7 are reproduced. From a point corresponding to the pressure and temperature at suction conditions, follow a vertical line of constant entropy to a point showing the discharge pressure. The temperature may be read directly. This is adiabatic compression, of course. If the analysis of the gas is available, the exact pseudo-critical temperature and pressure (required for use in determining the compressibility factor from figure 1) can be determined by methods shown elsewhere. [1] If only the gas gravity is known, these pseudo-critical constants can be closely approximated by curves which have been prepared for this purpose by the Gas Measurement Committee of the C.N.G.A. and they are presented in figure 4. The pseudo-reduced pressure, P_r is equal to the absolute pressure in pounds divided by the pseudo-critical pressure, P_c. The Pseudo-reduced temperature T_r is equal to the absolute temperature in degrees Rankine divided by the pseudo-critical temperature, T_c. With this information and figure 1 we can readily determine the compressibility factors for both suction and discharge conditions.

It is important that we get the relation between the compressibil-



ity factors at suction and those at discharge conditions. To make this clear, the compressibility factors at several suction conditions have been plotted on the compressibility factor curve, figure 1, and each of these has been connected by dotted lines to the corresponding compressibility factors at discharge conditions. As an illustration, ratios of compression of 3 have been chosen, and an intake temperature of 60°F has been selected in all cases. Gas gravities of 0.6 and 0.8 have been shown. In general it may be seen that the compressibility factors are lower at suction conditions than they are at the corresponding discharge conditions, except where the suction pressures on heavier gases are below the pseudo-critical pressure. In the few cases where the compressibility factor at suction is higher, there is not much difference between the factors.

It is interesting to note that the increase in temperature due to compression always tends to raise the compressibility factor at discharge, hence, in the left hand area of the curve, this effect tends to compensate for the drooping curves and equalize the factor at suction to that at discharge conditions. In the right hand area where the curves are rising, the effect is cumulative, and wide differences between factors at suction and discharge occur, with the greatest deviation from ideal gas laws occurring at suction conditions. This charateristic is important as it relates itself to the performance of compressor cylinders at high pressures.

Cylinder Capacity

Without doubt, the clearest method of showing the effect of supercompressibility upon the capacity of the cylinder is the conventional indicator PV diagram, figure 5. The end of the discharge stroke, 4, is a point fixed only by the construction of the cylinder and is the proper starting point for such an analysis. The clearance volume, 4-a, represents that which is in the cylinder head at the end of stroke of the piston. Under ideal gas laws the gas within this volume would reexpand back to point 1 according to the accepted Volumetric Efficiency formula

$$E_v = K - C\,(R^{\frac{1}{n}} - 1) \quad \text{(formula 1)}$$

where the value for K is theoretically 1.0, but is frequently assumed to lie between .95 and 1.0 to allow for ring and value leakages; C is the clearance in percent, R. is the ratio of compressions, and n is the exponent for the re-expansion. If the length of stroke 8—2 is chosen as unity, then the length of the suction line 1—2 is also the Volumetric Efficiency.

If the gas within the cylinder at discharge conditions has deviated from ideal gas laws and the compressibility factor is less than 1.0, the clearance volume 4-a contains a greater weight of gas, or more standard cubic feet than would be contained in this volume under ideal gas laws. If this volume is reexpanded down to suction conditions, and if no deviation from the gas laws occurs at this point, then the volume occupied by the clearance gas becomes

$$\frac{(b-1)}{Z_d} \text{ or } b - 5.$$

The volumetric efficiency in such a case is represented by 5—2.

Under **most** conditions as has been shown previously, when there is a deviation at discharge conditions, the deviation is still greater at suction conditions. In any event, whenever deviation exists at all

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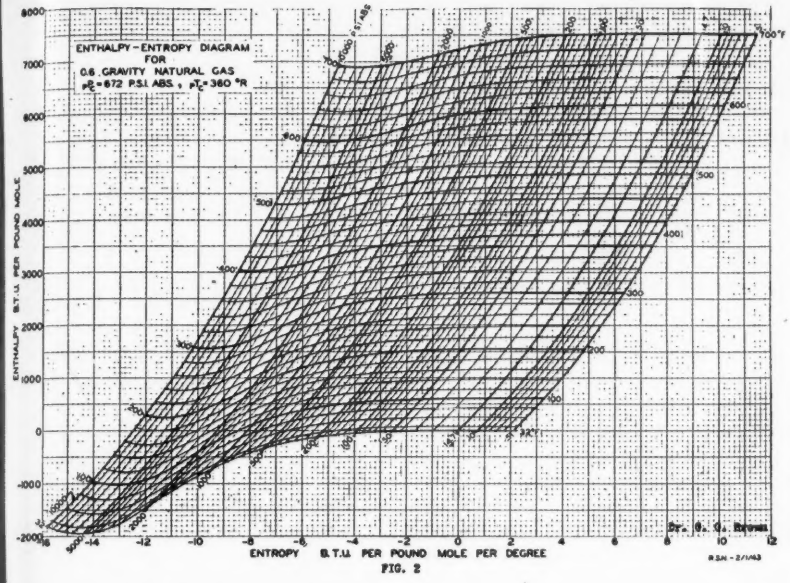

ENTHALPY - ENTROPY DIAGRAM
FOR
0.6 GRAVITY NATURAL GAS
p_c = 672 P.S.I. ABS. , T_c = 360 °R
ENTHALPY B.T.U. PER POUND MOLE
ENTROPY B.T.U. PER POUND MOLE PER DEGREE
Dr. G. G. Brown
FIG. 2

under suction conditions the volume occupied by the reexpanded clearance gas must be reduced from b—5 by the compressibility factor at suction, Z_s, which moves point 5 to point 6. (In figure 5 the compressibility factor at suction was smaller than that at discharge.) Thus we may say that the Volumetric Efficiency under conditions involving supercompressibility can be designated by E_{vz} and is determined by correcting the "expanded" clearance volume at suction pressure under ideal gas law conditions by the ratio $\frac{Z_s}{Z_d}$. This can be written as follows:

$$1 + C - E_{vz} = (1 + C - E_v)\frac{Z_s}{Z_d}$$

$$E_{vz} = 1 + C - (1 + C - E_v)\frac{Z_s}{Z_d} \quad \text{(formula 2)}$$

where C = percent cylinder clearance.

Or we can make the proper correction to the volumetric efficiency formula 1. Expanding the formula,

$$E_v = k + C - CR^{\frac{1}{n}}$$

The $CR^{\frac{1}{n}}$ term applies to the gas which is reexpanded, therefore this term must be corrected by $\frac{Z_s}{Z_d}$ to permit the formula to apply under conditions of supercompressibility. Under such conditions

$$E_{vz} = k + C - CR^{\frac{1}{n}}\frac{Z_s}{Z_d}$$

$$= k - C\left(R^{\frac{1}{n}}\frac{Z_s}{Z_d} - 1\right) \quad \text{(formula 3)}$$

It is obvious at this point that if the compressibility factor at suction is equal to the compressibility factor at discharge, even though they do not equal 1.0, the **shape** of the card is not changed, and

$$E_v = E_{vz}.$$

Thus we have a method of finding the Volumetric Efficiency under conditions involving gases which deviate from ideal gas laws. This is essential for the next step, that of finding the **capacity** of the cylinder under these conditions.

The gas which was taken into the cylinder along the new suction line 6—2 is "deviated" in proportion to the compressibility factor Z_s, and therefore to find the actual volume in standard feet of gas, the volume represented by 6—2 must be divided by Z_s. We can now say that

Cylinder capacity under conditions involving supercompressibility = Capacity calculated neglecting supercompress.

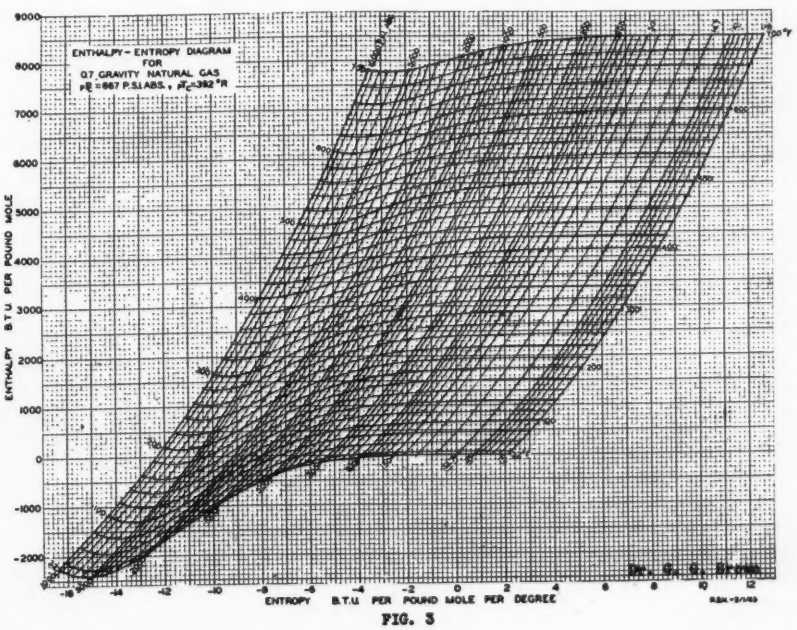
$$\times \frac{E_{vz}}{E_v \times Z_s} \quad \text{(formula 4)}$$

= Cylinder Displacement

$$\times \frac{E_{vz} \times \text{Suct PSIA} \times 520°}{Z_s \times 14.7 \times (460 + T° \text{ suct})}$$

(formula 5)

The formula can be used in either form except when $E_v = O$. Formula 5 must be used in this case.


ENTHALPY - ENTROPY DIAGRAM
FOR
0.7 GRAVITY NATURAL GAS
p_c = 667 P.S.I. ABS. , T_c = 392 °R
ENTHALPY B.T.U. PER POUND MOLE
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Dr. G. G. Brown
FIG. 3

Capacity Problem

In order to clarify the application of the foregoing, let us solve a problem involving cylinder capacity at high pressure. A gas of 0.65 gravity and 80°F temperature is to be compressed from 1500 psia to 4500 psia in a cylinder of 15% clearance whose displacement is 45,000 cubic feet per day. It is required to compare the capacity of the cylinder when deviation from ideal gas laws is neglected and when it is recognized:

Neglecting deviation, $E_v = K - C(R^{\frac{1}{n}} - 1)$

assuming the reexpansion "n" = 1.2

$K = .97$

$R = 4500/1500 = 3.0$

then $E_v = .97 - .15\,(3^{\frac{1}{1.2}} - 1) = .745$

$$\text{Capacity in Std. Cu. Ft./day} = \text{Disp. in C.F./day} \times E_v \times \frac{\text{Suct. psia}}{14.7} \times \frac{520}{T^\circ \text{ Suct.}}$$

$$= 45{,}000 \times .745 \times \frac{1500}{14.7} \times \frac{520}{540}$$

$$= 3{,}290{,}000$$

For the computations when deviation is recognized: The compressibility factor at suction conditions is determined thus,—

Pseudo-crtical Pressure, $P_c = 670$ psia (from fig. 4)

Pseudo-reduced Pressure, $P_r = \frac{P}{P_c} = \frac{1500}{670} = 2.24$

Pseudo-critical Temperature, $T_c = 373°R$ (from fig. 4)

Pseudo-reduced Temperature, $T_r = \frac{T}{T_c} = \frac{540}{373} = 1.45$

Compressibility factor at suction, $Z_s = .78$ (from fig. 1)

Similarly, the compressibility factor for discharge conditions can be calculated:

From fig. 2, rising vertically from the suction condition of 1500 psia and 80°F, to 4500 psia, the discharge temperature is seen to be 230°F for a gas of 0.6 gravity. Similarly, from fig. 3, the discharge temperature is seen to be 220°F for a gas of 0.7 gravity. For the required condition of 0.65 gravity, an average temperature of 225° may be assumed.

Pseudo-reduced Pressure, $P_r = \frac{P}{P_c} = \frac{4500}{670} = 6.72$

Pseudo-reduced Temperature $T_r = \frac{T}{T_c} = \frac{685}{373} = 1.84$

$Z_d = .96$ (from fig. 1)

$$E_{vz} = 1 + C - (1 + C - E_v) \times \frac{Z_s}{Z_d} \qquad \text{(formula 2)}$$

$$= 1.15 - (1.15 - .745) \times \frac{.78}{.96}$$

$$= .820$$

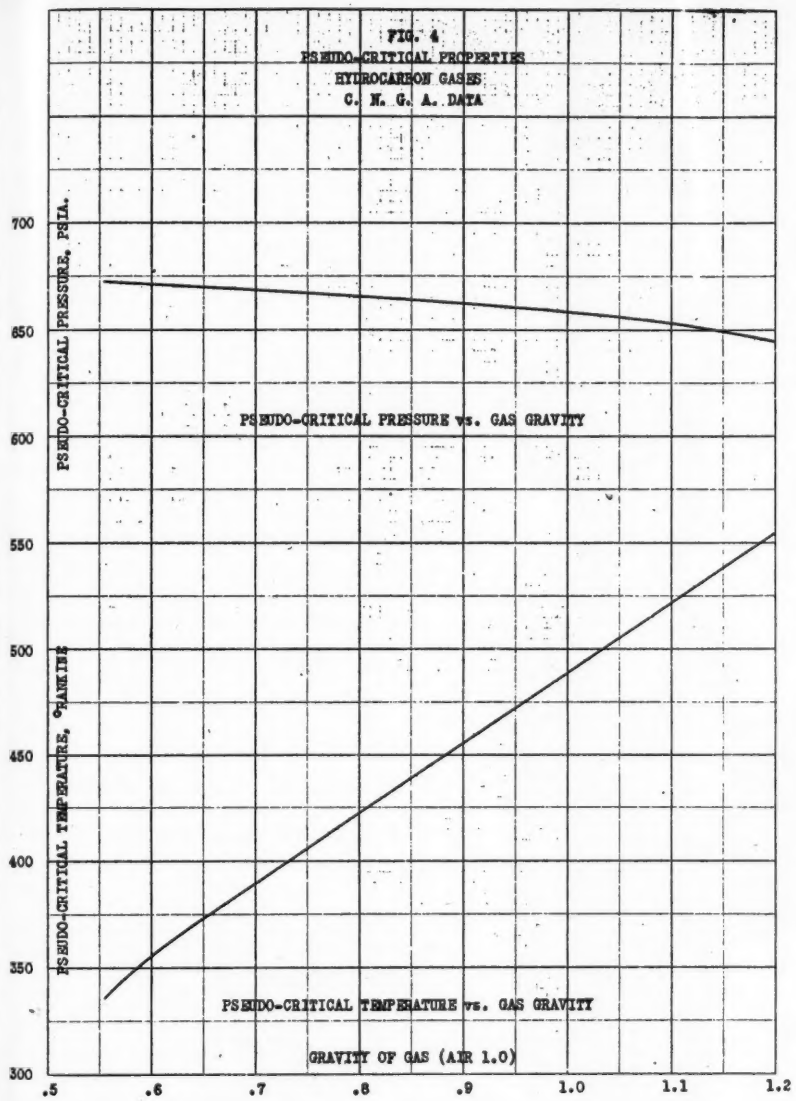
$$\text{Capacity} = \text{Capacity neglecting deviation} \times \frac{E_{vz}}{E_v \times Z_s} \qquad \text{(formula 4)}$$

$$= 3{,}290{,}000 \times \frac{.820}{.745 \times .78}$$

$$= 4{,}640{,}000 \text{ Standard Cubic feet per day}$$

Thus, due to supercompressibility, the capacity of this cylinder under these conditions has been shown to be greater by

$$\frac{4.64 - 3.29}{3.29} = 41.0\%$$



Effect of Clearance

Formulas (4 and 5) being related to Volumetric Efficiency indicate that the correction factors obtained therefrom vary with the percent of cylinder clearance. The reason for this is apparent from the diagrams of figure 6. If the clearance volume 4-a is small, then the volume b-1 is small, and so is the $\frac{Z_s}{Z_d}$ correction to it, 6-1. When the clearance 4-2 is large, b-1 is also large and the $\frac{Z_s}{Z_d}$ correction to it makes 1-6 much larger and a much greater proportion to the uncorrected E_v, 1-2. Thus, where Z_s is not equal to Z_d it becomes apparent that the greater the clearance, the greater is the effect of deviation upon cylinder capacity. Normally we **increase** the cylinder clearance whenever we desire to **decrease** the cylinder capacity. In the usual case, where Z_s is smaller, this unloading effect is reduced by the deviation from ideal gas laws. Indeed, one is entitled to wonder if increasing the clearance might not increase the cylinder capacity instead of decreasing it. Such is not the case, though the unloading effect due to adding clearance can be greatly offset by the application of formula 2.

The curve of figure 7 is shown to illustrate this effect. As in the foregoing example, gas of 0.65 gravity and 80°F temperature is being compressed from 1500 psia to 4500 psia. The compressibility factors at suction and discharge are noted. In curve A, cylinder clearances up to 40% are plotted against the percent increase in cylinder capacity due to supercompressibility. This curve shows that for a clearance of 40%, the cylinder can be expected to handle 198% of the volume calculated neglecting the deviation. At 0% clearance there is obviously no volumetric efficiency correction. The increase of capacity to 128% at this point is merely $\frac{1}{Z_s}$ or $\frac{1}{.78}$. Although horsepower has not been discussed as yet, it is plotted as curve B to make the group complete and to correspond with curve A. It is obtained merely by multiplying the percent increase in capacity as shown in curve A by 60.9/70, which is the ratio of horsepower per million std. c.f. per day when recognizing supercompressibility to the horsepower factor neglecting it. Curve C shows the decrease in cylinder capacity and horsepower with increase of clearance when no deviation occurs, using the capacity at 0% clearance as 100%. This curve merely constitutes a plot of the normal volumetric efficiency versus clearance relationship. Similarly, curve D plots E_{vz} and shows the decrease in capacity and horsepower due to adding clearance, when the capacity and horsepower at 0% clearance are taken as 100%, and the computations are corrected for the deviation from ideal gas laws according to the foregoing. The comparison of curve D with curve C shows the reduction in the unloading effect of adding clearance due to the deviation under these particular compressibility factors. Curves E and F are plotted to show the capacity and horsepower due to Supercompressibility if the capacity and horsepower of the same cylinder at 0% clearance neglecting the deviation equals 100%.

Horsepower Requirement

The effect of supercompressibility upon the horsepower of the cylinder is clearly shown on the indicator diagram. In a manner similar to that by which we corrected the

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AXELSON

DEEP WELL PLUNGER PUMPS

AND SUCKER RODS

reexpansion line, we can also correct the compression line. On figure 6 where Z_d is greater than Z_s (greater deviation from ideal gas laws at suction conditions) it is apparent that as the gas is being compressed, the deviation thereof will be reduced, and it will occupy a **greater** volume than it would have done had the deviation remained unchanged. By applying the ratio of compressibility factors at various pressure increments to those at intake conditions and correcting for the slight temperature differences, the true compression line can be plotted. This is shown on figure 6 as 2-7. It is obvious what happens to the horsepower requirement of a cylinder handling gas under the conditions shown. It is increased both on the compression and reexpansion ends of the cylinder. And, of course, the cylinder with the largest clearance provides the greatest percentage increase.

A great deal of confusion has centered around this point. Under most conditions of supercompressibility the horsepower required to compress a given weight of gas will be less than for ideal gas law conditions. For any particular compressor cylinder, however, if the deviation of the gas being compressed is greater at suction, that cylinder will handle an excess of gas great enough to more than offset the reduced horsepower per pound, and for this reason the horsepower required by the cylinder will be increased beyond the requirement for gases which do not deviate from ideal gas laws. From the indicator diagram it will be apparent that the only condition for which the size of the card (and therefore the horsepower of the cylinder) will be unchanged under conditions where the gas deviates from ideal gas laws will be that where the compressibility factor is the same at discharge as it is at suction conditions. In such a case the cylinder will handle an increased weight of gas as compared to ideal gas law conditions, due to Z_s in the denominator of formula 4. Because the horsepower for this cylinder is unchanged, then obviously the horsepower per pound is reduced. Usually, however, Z_s is less than Z_d and therefore we can generalize by saying that under most conditions of supercompressibility, the "horsepower per million" is decreased, but the horsepower per cylinder is increased. It is obvious that we must not confuse the two cases.

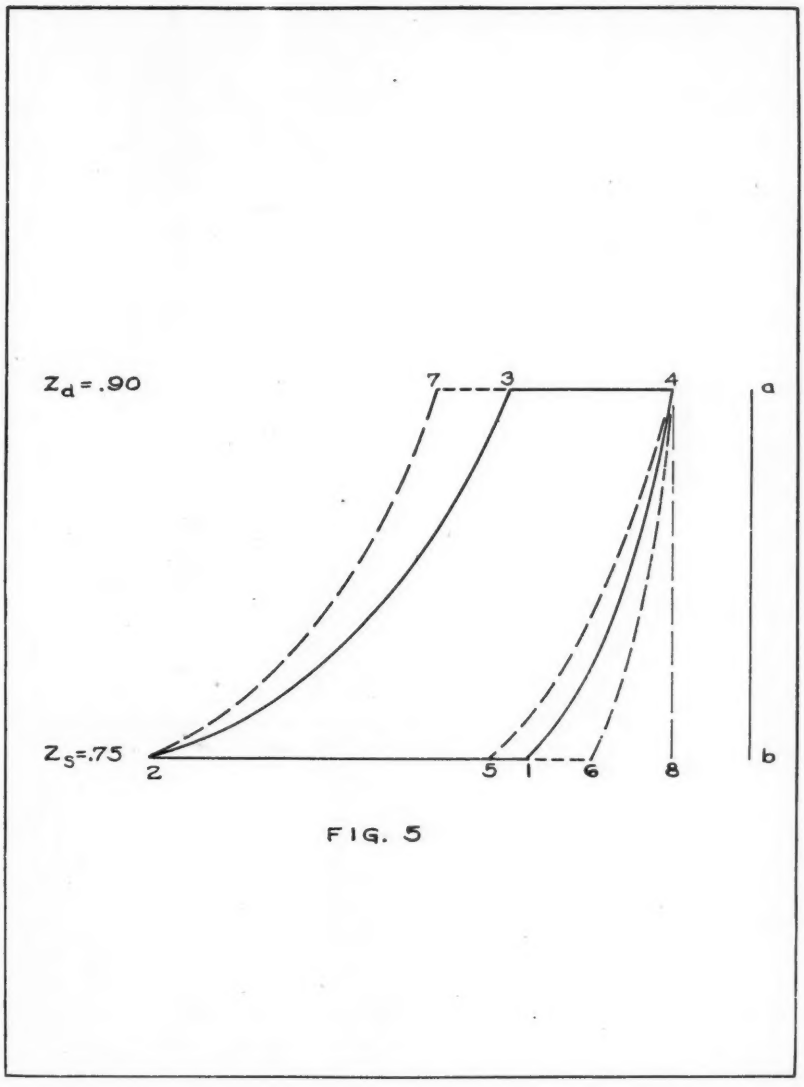


FIG. 5

Horsepower by Approximate Method

Since from the foregoing we can determine the **capacity** of any cylinder when handling gas which deviates from ideal gas laws, we have only to know how to obtain the horsepower per pound, or per million standard feet of gas under such conditions in order to determine the horsepower required for the cylinder. Several methods have been developed to provide it. The author has developed a very rapid approximate method which, in the solution of a number of problems covering a wide range of conditions, has given a maximum error of 2%. This method of determining the horsepower requirement consists of averaging the compressibility factor at suction with that at discharge and taking the average as the percent by which the horsepower per million neglecting supercompressibility is multiplied to find the corresponding horsepower per million cubic feet per day, measured at 14.7 PSIA and suction temperature when supercompressibility is considered.

Figure 8 is shown, slightly exaggerated, to illustrate what has been done in this approximate method. The solid card a, b, c, d would exist when compressing gas

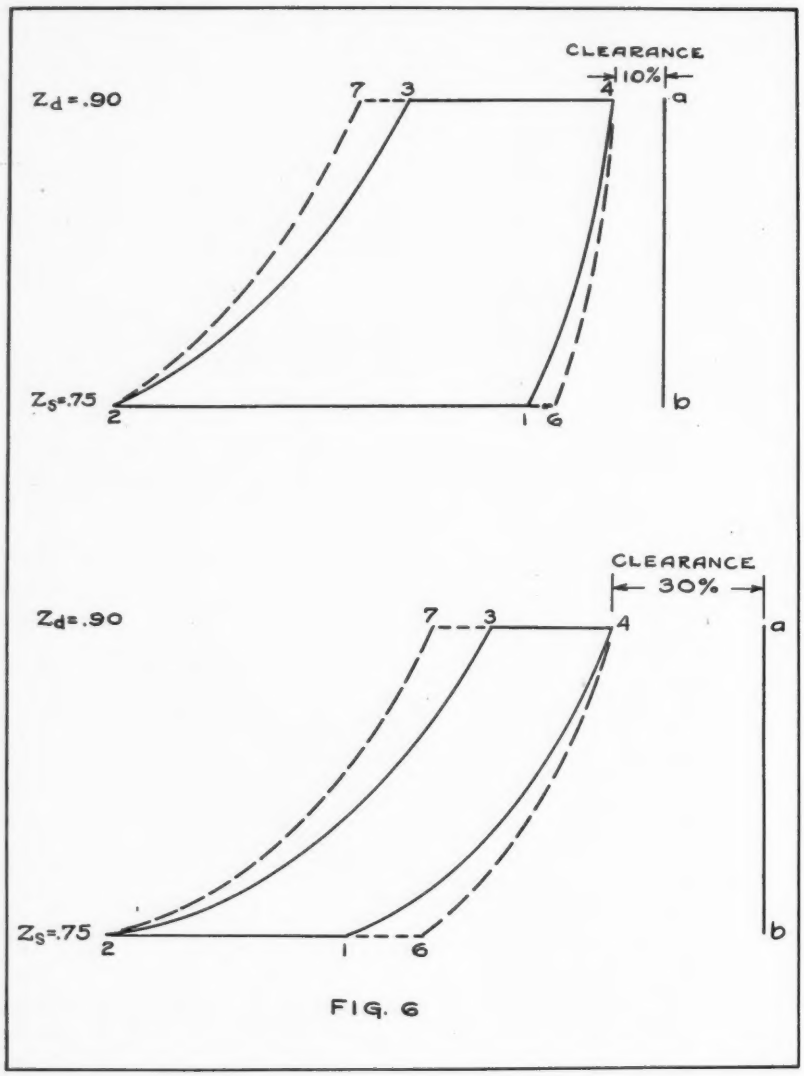


FIG. 6

without deviation from the gas laws. If the stroke on a single acting piston in the same cylinder is shortened so that the cylinder takes in the same weight of gas when it deviates from the gas laws, the card would become e, f, g, d. If we displace e,f to a,r, card a,r,g,d defines an area almost identical to e,f,g,d. The author's method of obtaining the horsepower by averaging Z_s with Z_d produces the card a,x,y,d. The amount by which area A differs from area B in percent of the total card is the major error in this assumption. Obviously, in the case where Z_s equals Z_d, the "n" values are not changed and this method is exact. In such a case the card would be a,r,s,d.

The statement was made that the greatest error found in the author's method of approximating the horsepower was 2%. What was considered to be the exact horsepower requirement was obtained by the tedious method of accurately plotting the normal indicator card to scale, then correcting it for supercompressibility at numerous intermediate pressure levels on the compression stroke by the ratio of $\frac{Z_y}{Z_s}$ and $\frac{T°_{zy}}{T°_y}$. For the reexpansion line correction, the clearance gas was corrected by the ratio $\frac{Z_y}{Z_d}$ for several pressures. The areas of the normal and the supercompressibility cards were then accurately measured. After correcting for the increased weight of gas in the cylinder when it had deviated from ideal gas laws, the horsepower per unit weight of gas was obtained for both cases. The ratio of the two was then obtained. This ratio was then applied to the accepted Brake Horsepower Charts to provide the exact BHP/MMCF for compression involving supercompressibility. This laborious method was only used to check the accuracy of the several methods of making horsepower determinations.

Horsepower by Average "n"

Edmister [4] has suggested that the horsepower required for hydrocarbon which deviate from ideal gas laws might be closely approximated if we knew the "n" value of the compression line both at the beginning and the end of compression, and used the average of the two in the theoretical horsepower formula

$$HP = \frac{144\ P_1\ V_1}{33{,}000}\ \left(\frac{n}{n-1}\right)\ \left[R\,\frac{n-1}{n} - 1\right]$$

This article dealt with hydrocarbons at relatively low pressures, and the $\frac{C_p}{C_v}$ ratio table presented therein would not cover the range of high pressures which are the subject of this discussion. However, the method gives a fair approximation for the horsepower in the high pressure area, provided we realize that the horsepower formula above is based upon perfect gas laws, and that the V_1 term must be corrected by the compressibility factor at suction. In this formula it will be recalled that to determine the horsepower per million standard feet per day it is customary to substitute $\frac{1{,}000{,}000}{1{,}440}$ for V_1, and 14.7 for P_1, regardless of what the actual initial pressure and volume might be. Such a procedure is predicated upon the assumption that Boyle's law holds, and that the term $P_1\ V_1 = k$. When Boyle's law does not hold, the product of $P_1\ V_1$ will likely be much smaller at suction conditions than at atmospheric pressure. Hence, to make it correct for the proper suction pressure we must multiply $P_1\ V_1$ at atmospheric pressure by

Z_s. In our concept of horsepower [5] we should recall the definition for work, which is the product of force times distance. If the gas deviates from Boyle's law, and the volume of gas to be compressed occupies a space smaller than Boyle's law would indicate, then the distance through which the force (piston) must act is reduced, and the work, and thus the horsepower per pound, is lessened.

The method of determining the horsepower by use of the average "n" is tedious but not difficult. The slope at the extreme ends of the compression line after making the supercompressibility and temperature corrections is determined by the familiar graphical solution, well described by Gill [6]. The average provides the "n" value needed. When someone provides us with

$\frac{C_p}{C_v}$ ratios ("n" values which will exist at suction and discharge conditions at the pressures being considered, this method of calculating the horsepower requirement will be greatly simplified. Differences up to 9% between this "average n" and the "exact" methods, previously described, have been noted when used in the high pressure range. Values so determined are nearly always low.

Horsepower From Mollier Diagrams

A simple method of finding the horsepower per pound or per million standard feet per day has been worked out for us by Dr. G. G. Brown in the Entropy-Enthalpy or Mollier diagrams for natural gases, [8] shown in figures 2 and 3. These diagrams have been developed from the chart of figure 1 and recognize the deviations from ideal gas laws. The enthalpy, or total heat in BTU can be read at a point corresponding to suction conditions, and by assuming that the work of compression follows the adiabatic path of constant entropy, a vertical rise to discharge conditions will indicate the BTU enthalpy at this level. The difference, expressed in BTU, is the work done in raising one pound mole of the gas from suction to discharge conditions. This can readily be converted to horsepower per million standard cubic feet per day from the knowledge that one pound mole of gas occupies 379 cubic feet at 14.7 psia and 60°F if Z = 1.0. And at standard conditions of pressure and temperature, any "deviation" is negligible and Z can be assumed to be 1.0.

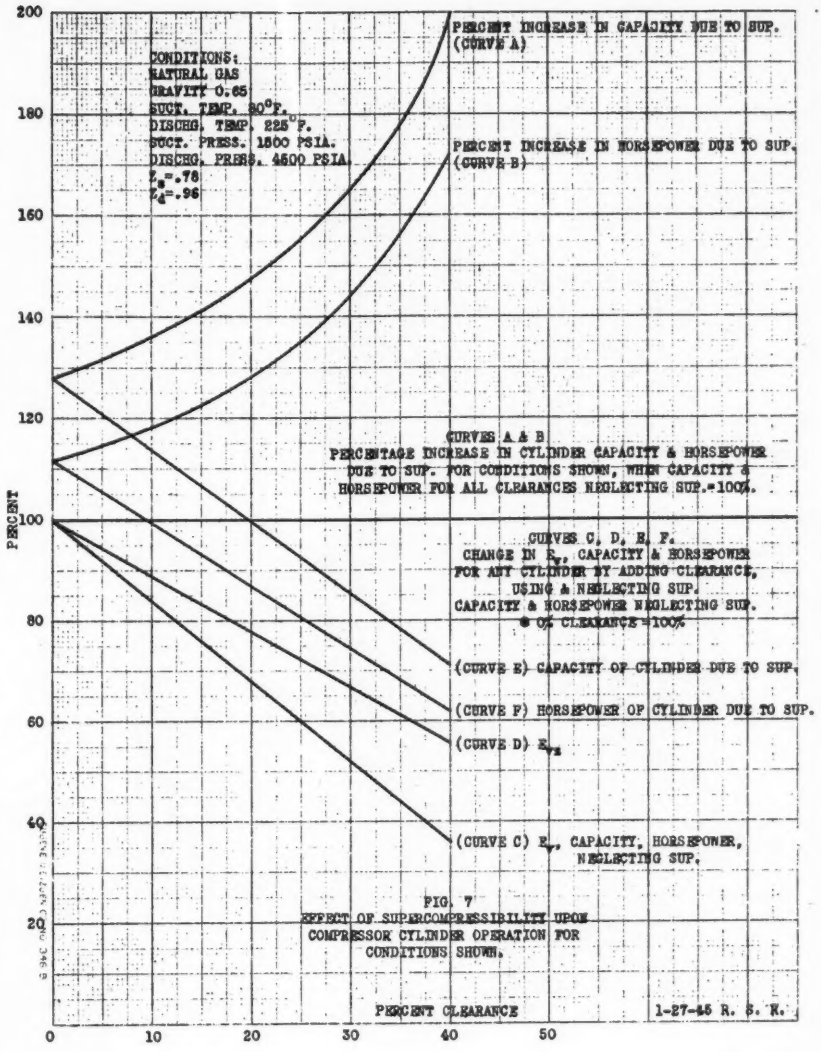


FIG. 7
EFFECT OF SUPERCOMPRESSIBILITY UPON COMPRESSOR CYLINDER OPERATION FOR CONDITIONS SHOWN.

1-27-45 R. S. N.

Thus, for any of the Mollier diagrams, the BTU difference shown for compressing the gas from one condition to another is the BTU required to compress 379 standard cubic feet through this range. Knowing that 1 BTU = 778 foot-pounds we can determine the conversion factor from BTU to theoretical HP per million standard feet per day by the expression

$$\text{Theor. HP/MMSCF/day} = \frac{\Delta \text{ BTU} \times 1{,}000{,}000 \times 778}{379 \times 24 \times 60 \times 33{,}000}$$

$$= \Delta \text{ BTU} \times .0432$$

It must be remembered that the Mollier charts provide BTU per pound-mole, and therefore the horsepower determined therefrom will be the horsepower per million **standard** feet per day, when the gas is at the suction temperature which was used in reading the Mollier chart.

By application of the proper factors, this theoretical horsepower can be converted to brake horsepower. The factors involved are the compression efficiency, which represents principally the compressor valve losses, and the mechanical efficiency of the compressor. These losses vary with the design of

Wilson TITAN MODEL RIG

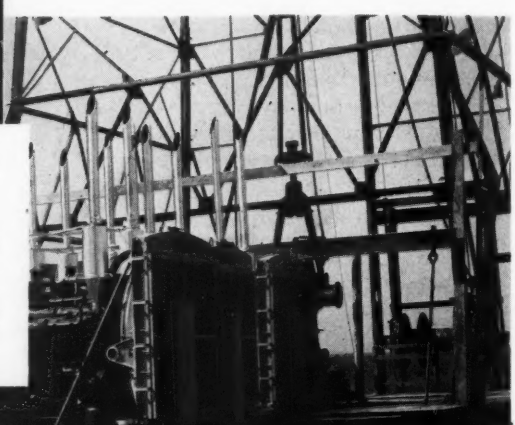
POWERED WITH THREE 350 H. P. GAS ENGINES *and* CLARK TRIPLEX 7¼ x 12 MUD PUMP

Chosen by T&T OIL COMPANY

Many California oil operators and drilling contractors have chosen WILSON POWER RIGS, among them Walter Thompson, veteran California oil man, and his partners, Horace and Jack Thompson.

Having obtained unusual success with WILSON Units, they now unhesitatingly choose a WILSON Titan Deep Hole Rig for contracting oil well drilling.

Due to new and outstanding engineering features in design, construction and capacity of the new CLARK TRIPLEX Steel Power Driven Mud Pump, it was natural that it should be chosen as a fitting partner for their WILSON Deep Hole Rig.



Above—WILSON Titan Model Rig—Sturdy, dependable and efficient—for deep drilling.

At Right—Drawworks and Pump powered by three 350 H. P. Le Roi Engines.

Below—The CLARK TRIPLEX PUMP is driven from a V-Belt Pulley on the power take-off shaft of the rear engine.

H&B SALES COMPANY

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PACIFIC COAST REPRESENTATIVE FOR WILSON AND DISTRIBUTOR FOR CLARK TRIPLEX MUD PUMP

equipment, speed, ratio of compression, etc. A comparison of the theoretical horsepower required per million cubic feet per day at 14.7 psia and suction temperature

$$\text{Horsepower} = 44.6 \times \frac{n}{n-1}\left(R^{\frac{n-1}{n}} - 1\right) \quad (7)$$

and the charts showing brake horsepower per million for hydrocarbons as published by Worthington [8] indicate that these combined efficiencies vary with ratio of compression as shown on figure 9. These efficiencies can be used for the determination of brake horsepower from the theoretical horsepower obtained from the Mollier charts.

Horsepower Problem

When applied to the same problem which was used to demonstrate the capacity calculations, we can determine the horsepower requirements by the author's method as follows: Averaging the compressibility factors,

$$\frac{Z_s + Z_d}{2} = \frac{.78 + .96}{2} = .87$$

(The "exact" method as described above gave a factor 1.6% lower than this.)

BHP/MMSCF/day neglecting supercompressibility = 70.0 (from BHP charts).

BHP/MMSCF/day recognizing supercompressibility = 70 x .87 = 60.9.

The decrease due to supercompressibility is 13%.

The capacity of the cylinder was previously shown to be increased to 4,640,000 Std. Cu. Ft./day under conditions of supercompressibility, therefore the

BHP for the cylinder = 4.64 x 60.9 = 283.

If supercompressibility were neglected, the load on this cylinder would be calculated to be 3.290 x 70.0 = 230 BHP.

The load increase due to the deviation from ideal gas laws is obviously

$$\frac{283 - 230}{230} = 23.0\%$$

The problem is a typical one. The capacity of the cylinder has been increased 41.0%. The brake horsepower per million per day has been reduced 13% by the effect of the deviation, but this gain in unit horsepower has been more than offset by the increase in cylinder capacity, resulting in an increase in cylinder horsepower of 23.0%. Curve B of figure 7 shows the percentage increase in horsepower due to supercompressibility for cylinders of various clearances, operating under the same conditions that were used for this problem. Certainly the wide differences caused by this phenomenon are of such an order of magnitude that they cannot be ignored. The conditions of gravity, temperature and compression ratio are probably quite similar to those found in cycling plants, hence the curves shown could be typical of actual field conditions.

One is entitled to ask, at this point, that if supercompressibility is sometimes ignored when computing compressor cylinder sizes or determining capacity and horsepower, why more trouble has not been encountered on such jobs? In the first place, it is problematical as to whether or not this practice of neg-

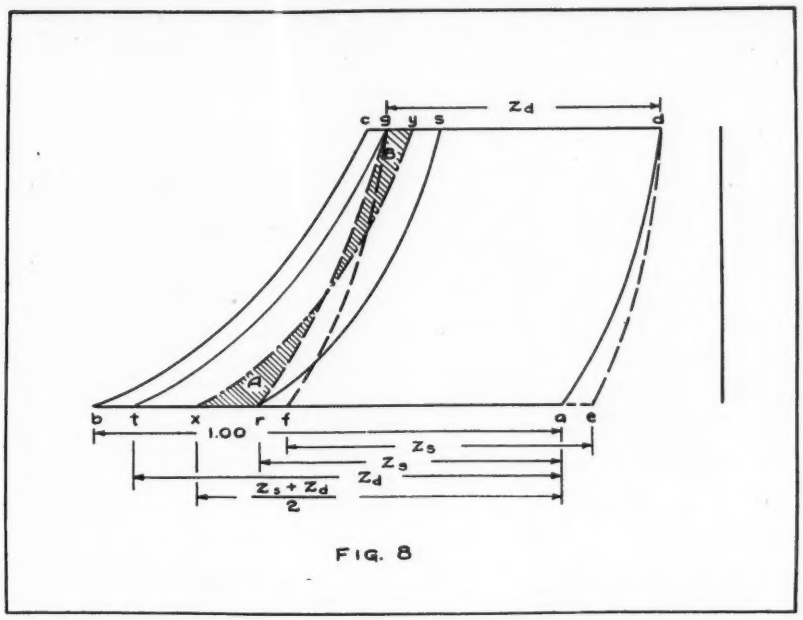
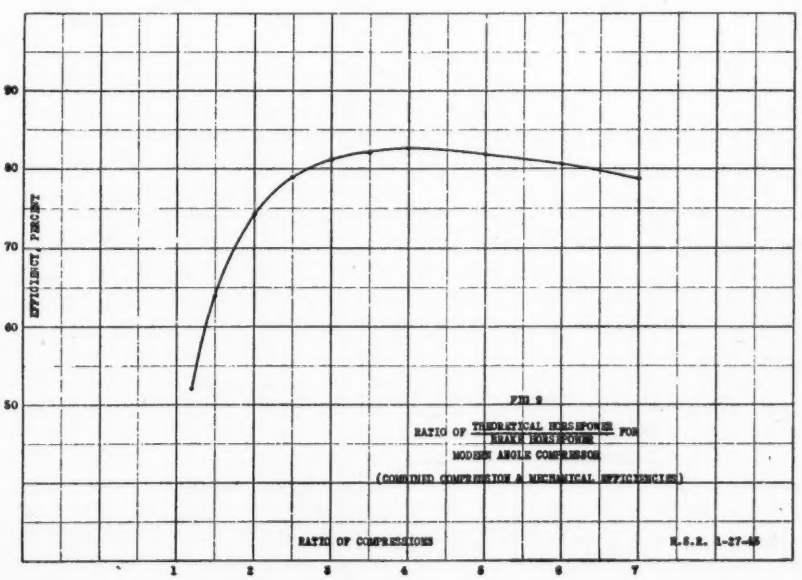


FIG. 8



lecting supercompressibility is really "widespread". High pressure installations are increasing, but their number is still relatively small, and what trouble has been caused from this source is rather hard to learn. If an operator handles more gas than he expects, he doesn't usually regard it as trouble. If his high pressure cylinder is greatly overloaded, it is usually only one of several cylinders on a single compressor, and the other cylinders often work on other services so that the overload is only on one cylinder out of the group. If a gas and load excess occurs on a unit carrying only high pressure cylinders, removal of a valve or addition of extra clearance usually remedies the situation so easily that it is not considered a problem. The modern gas engine driven compressor is so "over-powered" that it will take large overloads without much disturbance. Frequently the gas in a repressuring or cycling plant is two-staged, with cylinders of both stages on each compressor. In such cases the low pressure cylinder is usually not greatly affected by supercompressibility. The high pressure cylinder probably is. But the volume handled by each compressor unit is fixed by the capacity of the low pressure cylinder, therefore the excess capacity of the high pressure cylinder due to gas law deviation only serves to lower the intermediate pressure, and therefore no appreciable increase in capacity for the unit is obtained. Because the intermediate pressure is reduced, the load is reduced on both the low and the high pressure cylinders.

Even though the discrepancies described above may not, in some cases, be too hard to rectify, there is little excuse for us to make them. With the methods so easy to use we should size the cylinders to handle the correct throughput and be able to predict the correct horsepower requirement when gases deviate from ideal gas laws.

Above all, we should not fail to take advantage of the marked reduction in the horsepower requirement for compression due to supercompressibility. In the high pressures regions, reduction of 15% are common. Cycling plants frequently process huge volumes to high pressures and require large compressor installations. A reduction of 15% in horsepower in such cases represents no small saving in money. In a recent cycling plant installation, taking advantage of the reduction in horsepower due to supercompressibility meant the elimination of one compressor unit which, including installation costs, represented a saving that ran into 6 figures.

The methods which have been presented above will permit computations for compressor cylinder capacity and horsepower under conditions of supercompressibility to be made with good accuracy. They are simple and easy to use. It is hoped that the illustrations regarding the magnitude of the errors involved by neglecting the deviation from ideal gas laws in regions where it should be considered, and the savings which may be made by recognizing this effect, have been sufficiently convincing to encourage common use of these methods.

(1) Dr. G. G. Brown; Proc. of the 19th ann. conv of NGAA, May 1940, p54.
(2) "Deviation of Natural Gas at High Pressures", J. N. Smith (CNGA paper) Calif. Oil World, February 1940 p12.
(3) "A Series of Enthalpy-Entropy Charts for Natural Gases" Dr. G. G. Brown, Pet. Tech. July 1944 TP 1747.
(4) "Specific Heat Ratios for Hydrocarbons" W. C. Edmister, Ind. & Eng'ng. Chem. March 1940, p. 373.
(5) See "Air and Gas Compression", T. T. Gill, (Wiley) p.18.
(6) See "Air and Gas Compression" T. T. Gill Wiley) p 51.
(7) See "Air and Gas Compression" T. T. Gill (Wiley) p 21.
(8) "Plain Talks on Air and Gas Compression" vol IV, Worthington Pump & Mach'y Corp.

General Electric Appoints R. M. Alvord to President's Staff

Raymond M. Alvord, commercial vice-president and manager of General Electric Company's Pacific District, has just been appointed a member of the President's staff according to an announcement made on Feb. 8th by President Charles E. Wilson. Mr. Alvord will continue to make his headquarters in San Francisco.

To coordinate General Electric's widely diversified interests and afford better service to the company's wartime customers, both military and those industries manufacturing war materials, ten commercial vice presidents, representative of every sales district of the company in the United States will relinquish their responsibilities for apparatus sales and become members of the President's staff, according to the statement from the President's office.

Mr. E. O. Shreve, vice president in charge of customer relations, New York, well known on the Pacific Coast and manager of G.E.'s San Francisco office for a number of years, heads up the new staff.

R. M. Alvord

In discussing the new arrangement, Mr. Shreve said, "In addition to better coordinating the company's many interests, these men will also assist the various departments and the affiliated companies in all customer relations in their respective territories. I feel sure this new setup will greatly strengthen our ability to help our many wartime customers."

Mr. Allen G. Jones, formerly Pacific District Manager, Central Station - Transportation Department, will assume Mr. Alvord's duties as manager of apparatus sales in the Pacific District, according to Chester H. Lang, vice president and apparatus sales manager, Schenectady, N. Y. He will continue to headquarter in San Francisco. The company's Pacific District covers all of California, western Nevada, Arizona, and the Hawaiian Islands.

A graduate of Iowa State College, Mr. Alvord joined General Electric in 1904 at Schenectady, N. Y., as a test engineer.

McAlear and Hanlon-Waters Change Trade-name

Hanlon-Waters, Tulsa, and McAlear Manufacturing Company, Chicago, have integrated their operations and will conduct business as the Automatic Control Division of Climax Industries, of which Climax Engineering Company is also a division. The three companies, affiliated for the past year, have heretofore operated as separate businesses.

L. J. Griffey

General management, sales and engineering are also being centered under single heads in charge of these executive functions for McAlear and Hanlon-Waters plants. Edward F. Deacon, Climax president, has announced the following new appointments: L. J. Griffey, vice president and general manager; M. C. Waterman, vice president in charge of engineering; C. W. Snyder, vice president in charge of sales.

C. W. Waterman

C. W. Snyder

The two plants and all Hanlon-Waters branch offices and warehouses in the mid-continent oil field are being continued. In other territories sales will be handled through distributors. Export sales will be handled by General International, Chicago.

Climax and McAlear trade-names will designate all products in the future.

Toussaint Advanced by Standard

Jules E. Toussaint, general manager of operations in Standard of California's producing department, has been appointed general manager of the department.

Toussaint joined Standard 23 years ago as a construction assistant at the company's Richmond refinery after his graduation from the University of California with a B.S. in mechanical engineering. He became, in turn, a draftsman, engineer and assistant chief engineer at the refinery.

After being transferred to the company's San Francisco headquarters, he was named manager of the producing department's organization and cost control division. Later he went to Los Angeles as assistant general superintendent of the producing department's southern district. He returned to San Francisco in 1940.

During the latter part of 1943, he earned the title of "One-a-Day" Toussaint as a result of the completion of an average of one well a day by drilling operations under his jurisdiction. This pace has been accelerated, and in February this year his division set an all-time record in the company's drilling history with 67 well completions, or more than two a day. Thirty-nine of these wells were drilled in Elk Hills under Navy contract.

J. E. Toussaint

In 1944 Toussaint's staff broke the world's well depth record by drilling KCL 20-13 in the Coles Levee field near Taft, California, to 16,246 feet before it was abandoned.

Toussaint is a member of the API, the Petroleum Production Pioneers and the Commonwealth Club of California.

New Members C.N.G.A.

G. C. Averill, Cooper-Bessemer Corp.; M. E. Fields, So. Calif. Gas Co.; J. E. Gesner, Reliance Regulator Corp.; H. R. Hogaboom, Petroleum Equipment Co.; R. H. Hull, Pacific Lighting Corp.; and E. P. Treidler, Honan Crane Corp. have been elected members of the California Natural Gasoline Association.

Gordon G. Glidden, Superior Oil Co. has resumed his active membership in the Association after returning from Army duty.

California Oil World's Monthly Summary

DEVELOPMENT—PRODUCTION—SUPPLY & DEMAND
PACIFIC COAST TERRITORY

TABLE I—CALIFORNIA DEVELOPMENT—PRODUCTION

	JANUARY, 1945 DEVELOPMENT				PRODUCTION	
	Active Drilling Wells	Oil Wells Completed	Initial Production B/D	Oil Wells Completed First Month	Daily Average January 1945	Daily Average January 1944
SAN JOAQUIN VALLEY						
Ant Hill	1	2	239	2	438	.....
Antelope Hills	.....	2	505	2	1,951	1,675
Antelope Plains	.....	.....	.....	.....	28	.....
Arvin	.....	.....	.....	.....	20	39
Bellevue	.....	.....	.....	.....	406	.....
Belridge—North	4	.....	.....	.....	7,282	5,768
Belridge—South	3	16	616	16	12,916	8,242
Blackwell's Corner	.....	.....	.....	.....	84	.....
Brundage	.....	.....	.....	.....	58	.....
Buena Vista Hills	16	14	6,303	14	34,049	14,482
Burrel	.....	.....	.....	.....	65	.....
Canal	.....	.....	.....	.....	3,497	3,529
Canfield Ranch	.....	.....	.....	.....	37	35
Coalinga—East	1	3	139	3	22,362	20,959
Coalinga—Nose	.....	.....	.....	.....	62,642	68,068
Coalinga—West	2	3	158	3	8,076	6,642
Coles Levee—North	2	.....	.....	.....	14,366	18,285
Coles Levee—South	2	1	435	1	2,617	
Dyer Creek	.....	.....	.....	.....	.....	11
Edison	3	7	1,109	7	3,683	2,643
Elk Hills	26	31	13,021	31	48,344	15,463
Fruitvale	2	3	354	3	8,926	7,129
Gosford	1	.....	.....	.....	77	.....
Greeley	5	1	451	1	14,127	14,183
Helm	4	2	339	2	2,558	796
Jacalitos	4	4	1,287	4	1,856	304
Kern Front	7	1	34	1	12,876	12,335
Kern River	3	.....	.....	.....	9,729	9,060
Kettleman North Dome	6	3	626	3	40,896	41,980
Lanare	.....	.....	.....	.....	178	52
Lost Hills	1	.....	.....	.....	3,368	3,650
McClung	.....	.....	.....	.....	111	215
McKittrick	3	.....	.....	.....	5,014	4,533
Midway-Sunset	8	7	357	7	40,276	40,456
Mountain View	2	.....	.....	.....	2,932	3,378
Mount Poso	1	4	274	4	19,710	23,233
Paloma	4	2	1,057	2	852	918
Pleasant Valley	1	2	774	2	3,405	1,401
Pyramid Hills	3	3	78	3	405	.....
Race Track	.....	.....	.....	.....	28	.....
Raisin City—East	.....	.....	.....	.....	439	660
Raisin City—West	.....	2	631	2	2,928	923
Rio Bravo	.....	.....	.....	.....	16,262	16,221
Riverdale	2	2	202	2	5,069	2,919
Round Mountain	2	2	80	2	9,857	11,373
Shafter	.....	.....	.....	.....	6	9
Sheep Springs	1	1	221	1	286	.....
Strand—East	1	.....	.....	.....	743	294
Strand—West	.....	.....	.....	.....	1,630	1,900
Tejon	6	.....	.....	.....	286	98
Ten Section	.....	.....	.....	.....	12,106	14,566
Union Avenue	.....	.....	.....	.....	61	145
Wasco	.....	.....	.....	.....	1,783	2,630
Wheeler Ridge	.....	.....	.....	.....	234	241
Miscellaneous	1	.....	.....	.....	26	.....
TOTAL SAN JOAQUIN VALLEY	128	118	29,290	118	441,961	381,443
COASTAL AREA						
Aliso Canyon	3	.....	.....	.....	3,499	2,446
Capitan	1	.....	.....	.....	2,200	3,428
Del Valle	1	.....	.....	.....	1,823	1,336
Elwood	1	1	210	1	5,656	5,996
Gato Ridge	2	1	487	1	4,705	4,465
Newhall-Potrero	2	.....	.....	.....	4,467	5,505
Oak Canyon	2	.....	.....	.....	1,790	975
Padre Canyon	1	1	655	1	1,909	871
Rincon	3	1	123	1	4,675	3,216
San Martinez	1	1	186	1	2,686	1,873
San Miguelito	2	1	431	1	5,820	5,531
Santa Barbara	.....	.....	.....	.....	65	92
Santa Maria	2	1	456	1	14,181	12,826
Santa Maria Valley	8	8	1,758	8	37,759	25,123
Summerland	.....	.....	.....	.....	5	8
Ventura Avenue	12	3	1,372	3	46,679	44,338
Ventura-Newhall	15	5	396	5	6,595	4,780
Watsonville	.....	.....	.....	.....	25	25
TOTAL COASTAL AREA	56	23	6,074	23	144,539	122,834

MONTHLY SUMMARY—Continued	JANUARY, 1945 DEVELOPMENT				PRODUCTION	
	Active Drilling Wells	Oil Wells Completed	Initial Production B/D	Oil Wells Completed First Month	Daily Average January 1945	Daily Average January 1944
LOS ANGELES BASIN						
Brea-Olinda	.....	.....	.....	.....	11,813	11,508
Buena Park	1	.....	.....	.....	123	91
Coyote—East	1	1	260	1	5,210	5,520
Coyote—West	4	.....	.....	.....	12,633	12,131
Dominguez	2	1	24	1	19,472	23,120
El Segundo	.....	.....	.....	.....	806	1,014
Huntington Beach	7	5	954	5	47,300	41,481
Inglewood	1	.....	.....	.....	16,263	18,915
Lawndale	.....	.....	.....	.....	28	28
Long Beach	3	.....	.....	.....	28,199	30,598
Los Angeles-Salt Lake	.....	.....	.....	.....	496	445
Montebello	1	.....	.....	.....	10,875	10,641
Newport	2	.....	.....	.....	76	22
Playa Del Rey	.....	.....	.....	.....	2,591	2,499
Potrero	.....	.....	.....	.....	943	987
Richfield	3	1	254	1	7,162	6,884
Rosecrans	4	.....	.....	.....	5,966	5,820
Santa Fe Springs	.....	.....	.....	.....	18,069	19,024
Seal Beach	5	1	107	1	8,483	7,590
Torrance	7	6	199	6	8,670	8,571
Turnbull Canyon	.....	.....	.....	.....	195	290
Whittier	1	.....	.....	.....	1,013	1,075
Wilmington	7	12	1,544	12	98,981	99,549
Yorba Linda	.....	.....	.....	.....	644	714
TOTAL LOS ANGELES BASIN	49	27	3,342	27	306,011	308,517
Outpost Wells	20	.....	.....	.....	.....	.....
Wildcats	25	.....	.....	.....	.....	.....
Gas Wells Completed	.....	3	.....	3	.....	.....
Drilling Wells Abandoned	.....	30	.....	30	.....	.....
TOTAL CALIFORNIA	278	201*	38,706	201*	892,511	812,794

*—Includes gas wells completed and drilling wells abandoned.

TABLE II—SUPPLY AND DEMAND FOR PETROLEUM PRODUCTS
PACIFIC COAST TERRITORY
DATA FOR NOVEMBER OF EACH YEAR
1938—1944

	January 1939	January 1940	January 1941	January 1942	January 1943	January 1944	January 1945
RAW MATERIAL—B/D							
1. Crude Oil Produced—California	621,742	611,612	609,065	628,621	764,075	812,794	892,511
2. Crude Oil from outside 5 Western States	.....	1,548	1,645	2,766	3,150	4,818	8,005
3. Natural Gasoline Produced	41,000	38,000	37,000	36,000	35,000	40,000	41,000
SUPPLY OF FINISHED PRODUCTS							
ALL SOURCES—B/D							
4. Natural Gasoline and L. P. G.	1,613	10,580	7,290	15,484	18,645	10,160	18,097
5. Gas., Naphtha Distillates & Condensate	221,225	213,838	218,645	210,774	235,419	307,225	335,032
6. Kerosene and Kerosene Distillates	6,290	10,903	8,387	2,774	8,742	10,064	5,419
7. Lubricating Oils, etc.	11,194	8,516	12,871	9,258	10,161	13,548	11,355
8. Gas Oil and Diesel Oil	81,484	79,903	84,774	58,194	77,258	80,226	76,645
9. Fuel Oil Residuum	240,806	237,194	250,516	244,355	389,065	463,646	471,967
10. Asphalt and Road Oils	10,226	6,968	10,582	14,936	20,193	15,742	20,484
11. Coke and Other Finished Products	1,677	3,194	2,612	3,258	1,580	420	3,161
12. Miscellaneous and Losses	**92,806**	**84,290**	**58,162**	**119,711**	**55,002**	**(18,065)**	**45,226**
13. TOTAL SUPPLY	667,321	655,386	653,839	678,744	816,065	882,966	987,386
14. TOTAL DEMAND	588,676	669,676	689,385	670,454	748,486	992,839	1,065,743
15. DIFFERENCE	78,645	(14,290)	(35,546)	8,290	67,579	(109,873)	(78,357)
16. Stocks on hand End of each month (total bbls.)	165,739,000	157,023,000	150,029,000	141,824,000	132,059,000	100,359,000	86,439,00

Give to The Red Cross

Kern County Oil News

Over Tehachapi's green slopes have come the "king pins" and the "bull wheels" of the oil industry. The traffic is not unusual but this cargo rested at hotels instead of on platforms. In all the world no area like Kern's is more colorful, adventuresome, exciting and romantic or stable in oil industry. For years observers have watched this old parade, but the pattern is the same. Perhaps in all industrial history no other enterprise is more rugged, resourceful, independent or more American.

No contribution to war effort, to building of communities and exalting the good way of life can scarcely record a more fruitful example. This real ingenuity has won respect and praise. The coming of the spring with its Dhammapda (the pathway of flowers) gives rise to pause and re-appraise with mixed excitement and appreciation, the great inventory of the Golden Empire of Kern.

To Kern County this month came Don Ingersoll, a visitor from Los Angeles, where the land department of The Texas Company returns him as a former resident to check on values and lease activities. While resident here some years ago Don was once connected with the Union Oil Company.

Signs of spring. Tax experts (more than fifty miles from home) this week unpacked their baggage at Kern hotels. Two purposes suggest themselves . . . 1) tearing down old equipment, (great stuff to tax assessors) 2) watching county budgets being filed with S. A. Woody, Kern's favorite county auditor for 30 years.

Joe McDonald founder of Taft's first public utility has seen a fortune come and go and return in oil. A senior operator he, no youngster prowls the fields and does a bigger better job than Joe McDonald at three score years and seventeen.

More signs of life and spring took form at Edison where Harry Campbell of Jergins Trust had spent the time of day, not picking wildflowers.

Ernie Blanck of Quality Oil is spending the equinox at Taft Community Hospital. Here he has traded logging books for nurses bulletins.

San Joaquin Geological Society held its March meeting at the El Tejon in Bakersfield and had for its guest Joe Jensen of Tide Water Associated. President Glen Ledingham of Western Gulf and vice president J. D. Cerkel U. S. G. S. absented by emergencies called Herm Weddle the secretary to take over affairs of state. Lieutenant Ted Bear of the U. S. Navy, Elk Hills presented an interpretation of aerial photography as it was actually used by Air Photo Division of the Navy on the eve of the invasion of France. Colonel Frank Hornkohl, well known chemical engineer, recently "inactivated" by the army participated in the program.

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Betty Loudon daughter of Kern's well known farmer and apiarist Roy W. Loudon is a graduate of Mills College and a paleontologist. Employed by Stanley Beck a commercial micro-paleontologist, Miss Loudon has a crediable and unusual vocation.

Up from San Francisco (Kern's elevation begins at 300 feet) came F. A. Menken, chief geologist, Tide Water Associated Oil Company, to Bakersfield he is a visitor on business for ten days.

R. B. Hutcheson, chief paleontologist for the Superior Oil Company has been employed by that firm since 1931. Hutcheson holds a master's degree and finished Ohio State in 1922.

Joe Thomas, nephew of Joe McDonald returned to Stanford this week to do some posting on his "masters". Young Joe recently discharged from the army farmed out himself for a "wee bit" of practical oilwell knowledge before resuming studies at college.

On business L. F. Baash, president of big Baash-Ross Tool Company, rolled up to Kern one day this week unnoticed by some. With him came Inky Wotkyns, branch boss at Taft, better known as USC's flashy full back in 1934.

According to "Chuck" McNavin the Western Oilfields Supply with a crew of 4 can lay up to 7,000 feet a day of three inch pipe supplying wildcats with oil and gas. This amount of pipe can be removed in four hours, but it would take four men eight hours to lay 1,000 feet of threaded or welded pipe. "WOSCO" as the new firm trade name appears uses Victaulic coupled method.

Someone asking "what's become of" Warren Ten Eyck at the scouts luncheon the other day, was agreeably surprised to turn around and spy him then and there. Warren was up from Los Angeles going about his petroleum engineer's business in a friendly fashion that becomes him.

Honored recently at Bakersfield Inn were Tide Water Associated's J. G. Kofahl retiring production foreman and store keeper Henry Hasch. George Suman Superintendent, and chief company executive here, presided over a luncheon affair which marked the occasion.

Johnston Stainless Welding Rods

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•

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Speaking of George Suman long engaged in "rotary" processes is now invested with the prexyship of Oildale Rotary Club, processing community service.

Oldsters here were shocked to hear of the passing of John Lee Beach, father of Jack Beach, with the Independent Exploration Company, Jack's father was well known among oilfield pioneers in the yesteryears of the industry before he had retired and moved to Hollister

Of the 3,364 bills introduced before this session of the legislature, more than 30 have been identified as ones affecting the independent oil producers.

Dana Hogan of Hogan Petroleum is back in Washington counting those bills which affect the industry as a whole nationally. According to Hugh McKay local "rigswig" he is doing something more than just counting them.

It is with considerable satisfaction that we learn of Charlie Premo's election to the office of Secretary of San Joaquin Valley Oil Producers Association.

It's a funny thing what printers ink will sometimes do. Maybe this is imagination but the scouts table has had twins lately and more leaves have been added. Perhaps the upping of production has priority over geological gossip.

"What's-become-of-week" will be introduced through this column for the purpose of re-creating the "Paleo" bird, (an old crude smeller) who drills backwards over the ground which was once thought to be related to wildcats). Why not send in a few back flights. Start in with the Dick Bros., Hood and Ashe who made a success of the oil business before string tools were shoved off supply platforms.

Remember old Supply Row? well it has a new neighbor . . . "Contractors Row" . . . Pierce Road and "99" at Bakersfield. Old welded pipeline form rafters of brand new swanky construction now going on with Rocky Mountain Drilling Company. Have to see it to believe it . . . the whole "Drillers Boulevard Drive" is taking on new neighbors. Even the County Planning Commission is designing another traffic circle for the intersection Pierce Roard and "99".

CASING PROTECTORS • STABILIZERS • PIPE WIPERS • WIRE LINE GUIDES • WIRE LINE WIPERS • KELLY WIPERS
KELLY SUB PROTECTORS • MUD GUNS • MUD GUN NOZZLES • SWIVEL BAIL BUMPERS • DEAD LINE STABILIZERS
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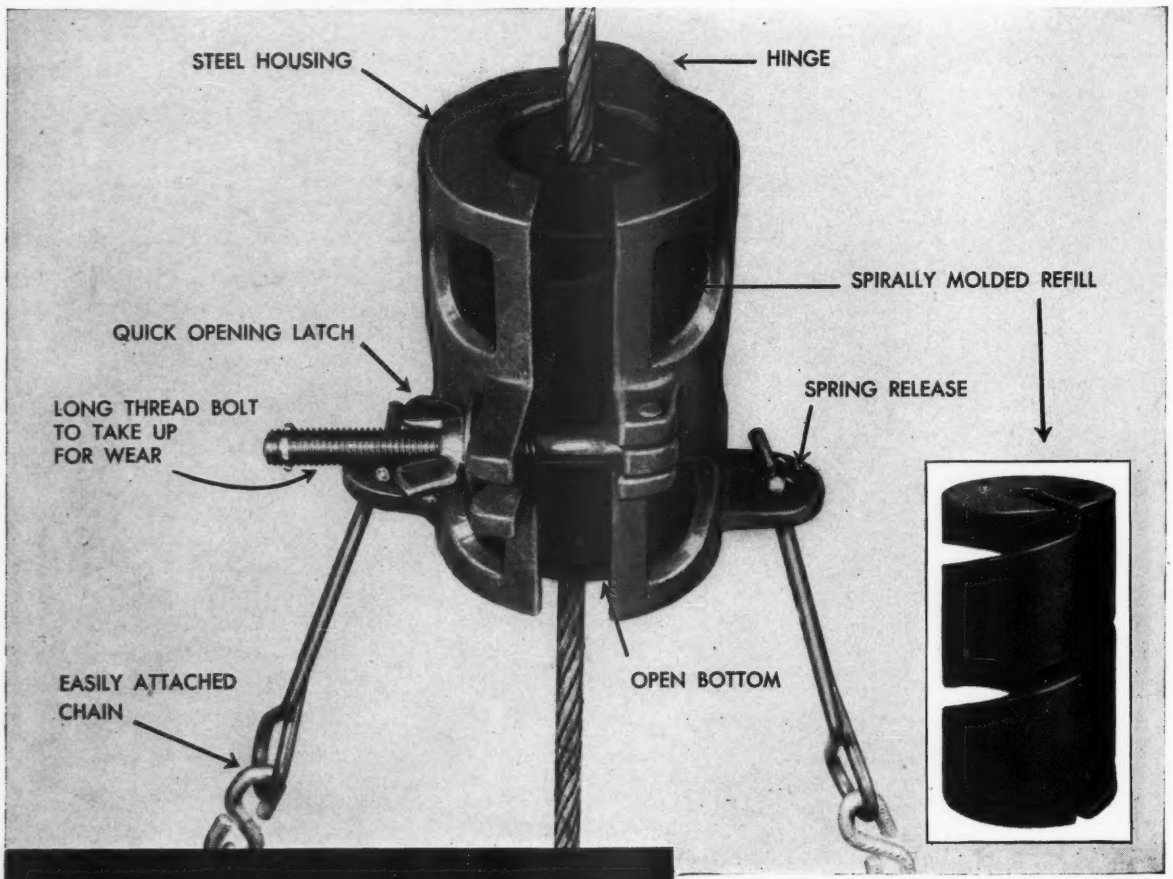
When it comes to keeping wire line clean, the new PATTERSON-BALLAGH Wire Line Wiper does a most efficient job. Smart operators specify its use in wiping mud or oil from the wire line being withdrawn from drilling or producing oil wells.

The wiper is an easily replaceable, inexpensive refill element, spirally molded of PBX rubber, which effectively grips the line with minimum friction. No seams are exposed. No metal contacts the line. There is nothing to create a "fishing" hazard. There are no delays, as the Wiper automatically disengages as the tool comes out of the hole.

See Composite Catalog



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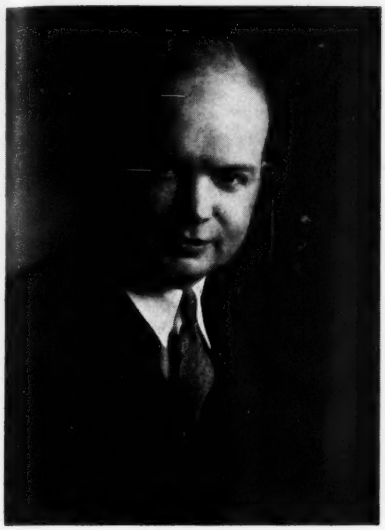


L. A. Little
Elected Vice Pres. in Charge of Sales

E. P. Trout
Elected Vice President

A. E. Cudlipp, Vice President
Named Board Member

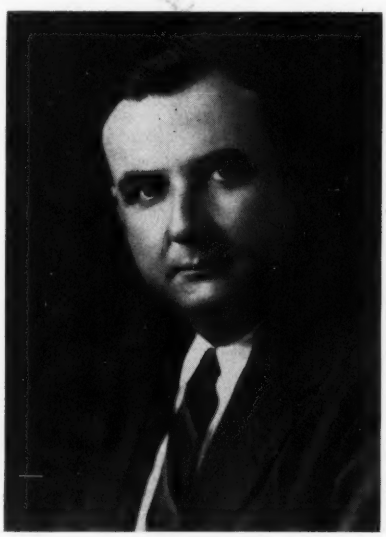
Lufkin Foundry & Machine Company Announce Executive Appointments

At the annual meeting of stockholders and directors of the Lufkin Foundry & Machine Company, Walter W. Trout was named Vice President and General Manager; L. A. Little, Vice President in Charge of Sales, and E. H. Bounds, Treasurer. E. P. Trout and L. A. Little were elected Vice Presidents.

A. E. Cudlipp, Vice President in charge of purchases and the Industrial Supply Division, and Jacque Wiener, of Shreveport, were added to the Board of Directors. Other Directors are W. C. Trout, President, J. H. Kurth, Jr., Vice President, E. L. Kurth, W. W. Trout, L. A. Little and S. W. Henderson, Jr.

L. A. Little, named sales manager, has long been identified with the Lufkin company, having been, for many years in charge of the company's Dallas office.

E. P. Trout, newly elected vice president, has been in charge of California sales for the past ten years. Mr. Trout will continue to direct California sales and, in addition, will supervise foundry operations at the Lufkin plant.



W. W. Trout
Elected Vice Pres. and General Manager

Walter W. Trout, vice president and general manager, has been in charge of the company's Tulsa and Dallas offices and, in recent years, has relieved his father as general manager.

W. C. Trout will act in the capacity of president, a position he has held for many years. Mr. Trout, holding many patents important to the oil industry, will devote a great deal of his time to the future of research.

A. E. Cudlipp, newly elected Board Director, has been active in the company for the past 26 years, serving in various capacities having to do with purchasing, publicity and sales promotion and in charge of the company's industrial supply division.

Petroleum Production Pioneers Meeting April 20th

S. H. Grinnell, President of Petroleum Production Pioneers, announces that the next meeting of that organization will take place Friday evening, April 20th, at the Mayfair Hotel in Los Angeles. Cocktails will be served at 5:30 followed by dinner at 6:30 and an outstanding program which is being arranged by Program Committee Chairman E. B. Fowks.

"These get-togethers of the retired pioneers, veterans of the producing and allied portions of the industry still active, and the younger men in those groups have proved increasingly valuable," said Mr. Grinnell in announcing the meeting. "Most of the men intensely enjoy the get-together feature of each meeting and look forward to it with anticipation. With a good program, too, we are sure that the attendance will be large."

West Torrance Well Scheduled

St. Francis Oil Co., Beverly Hills, leaseholder of approximately 75 acres in the vicinity of Victor and Emerald streets in Redondo, known as the West Torrance field, plan to start a fifth well there in the near future.

Homco Adds to Service

Houston Oil Field Material Co., Inc. of Calif. have added to their Directional Drilling Service, Sperry-Sun's K-K Removable Whipstock and the M-M-O Direct Method of Bottom Hole Orientation.

In order to furnish a more complete service for the Los Angeles Basin and Coastal Areas, they have moved their California headquarters from Bakersfield to 3803 Atlantic Avenue, Long Beach.

G. E. Matter

G. E. Matter, District Superintendent of Homco also has moved his headquarters to Long Beach.

L. A. Munsey, Wayne Smithson, Benny West and Howard Ward are working out of the Long Beach office servicing the Los Angeles Basin and Coastal Areas, while Leland Mitchell and "Chuck" McKaye are servicing the Valley from Homco's Valley Warehouse at 30th and M Streets, Bakersfield.

Carrington King

(Continued from Page 3)

fornia's right to the tidelands. Even more encouraging is the attitude taken by Congressmen from the non-oil-producing States who are looking at the matter from the viewpoint that Ickes' interest in the offshore oil deposits may well be extended in the future to cover billions of dollars worth of port facilities, shipyards, railroads, factories and other installations constructed on made-land below the normal high-tide mark.

Before dropping the subject of House interest, West Coast reports that Doyle is playing with the Interior Department and with individuals who would like to see title to the tidelands established in the U. S. do not have any visible evidence in Washington. It was through the Long Beach member of Congress that Ickes' hand was forced and Doyle has worked tirelessly to promote protective legislation in both Houses of Congress. Although the Hebert resolution beat the Doyle resolution by a few hours, the Californian was the first member in either House of Congress to recognize the need for Congressional action.

California oil men, in Washington for the March meeting of the Petroleum Industry War Council, found tidelands the hottest topic of conversation but action in the form of a resolution supporting the Congressional legislation or otherwise bearing on the issue was put over to the next meeting.

Among the Californians who discussed tidelands in hotel rooms, at the PIWC recesses and on Capitol Hill were: Bert Mattei, Harry March, Sam Mosher, Ernie Pyles, Dana Hogan, Charlie Garretson, J. Howard Marshall, and Robert E. Allen.

BUY WAR BONDS

Charles O. Premo is favorite selection by the San Joaquin Valley Oil Producers Association for Secretary. Mr. Premo succeeds the late Thos. W. McManus as Secretary Manager of the valley group, according to Dana Hogan, President of the organization. Other officers of SJVOPA (pronounced chev-voppa) are Allen Jergins Vice President and H. F. Owen, also a vice president.

Charley Premo is a native of California and was reared and educated in the San Joaquin Valley, having later graduated from the University of California.

For a great many years Premo was in the insurance and real estate business, having spent much of his time at Porterville. Since 1938 he has been an associate with Thos. W. McManus as office manager and is acquainted with the mechanics of the SJVOPA. He is married and has a daughter now employed with the local radio station KERN.

Holly Hayter Honored For 35 Years Service With Tide Water Associated Oil Company

J. H. Hayter, familiarly known to all as "Holly," the genial Assistant Purchasing Agent of Tide Water Associated Oil Company in charge of the department's Los Angeles office, was guest of honor at a dinner held at the University Club in Los Angeles on March 5th, when his associates presented him with a scroll in commemoration of his thirty-five years of service with the Company. Holly also proudly displayed the three diamond emblem presented to him by William F. Humphrey, President of Tide Water Associated, in recognition of his thirty-five years of service.

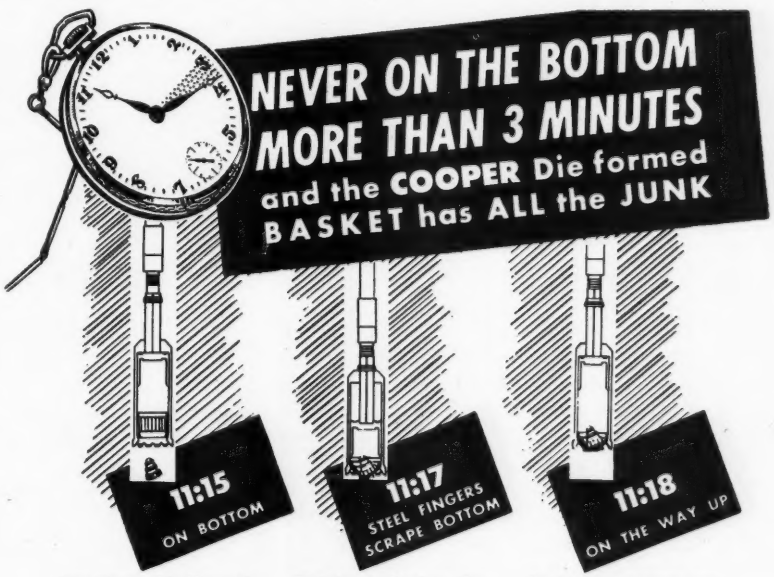
Holly Hayter came to California from his native town of Stockton, Missouri, in 1909, and started to work for Associated Oil Company as an office boy at Oil Center shortly after the Company began operations in the Kern River Oil fields. He took up stenography which led to the position of secretary to L. J. King, a pioneer of the California petroleum industry, who was then Superintendent of Associated's Production Department. A few years later Holly became storekeeper in charge of the store department for the Midway Division. In 1918 he was transferred to the Company's Purchasing Department at San Francisco and was buyer for the Marine Department under A. P. MacKillop, General Purchasing Agent.

In 1922, Holly became Assistant Purchasing Agent in charge of the department's Los Angeles office, where he has built up a host of friends within and outside the petroleum industry.

Holly Hayter is a fisherman and a golfer of note. He is a charter member, a director and past president of the Nineteeners, a well known Southern California golfing group formed several years ago of nineteen original members to meet periodically for golf and dinner—and the nineteenth hole to verbally replay their shots. The Nineteeners membership is comprised of executives prominent in all branches of the petroleum and allied industries.

There were 25 of his associates gathered at the dinner to pay tribute to Holly Hayter and congratulate him on his admirable record during his thirty-five years of service with Tide Water Associated Oil Company. Holly assured all he will carry on for many years to come.

J. H. "Holly" Hayter (right) being presented by District Manager E. C. Heinz with scroll signed by his associates commemorating the completion of 35 years of service.



The Cooper Die-Formed Basket, attached to the drill pipe by your own crew, is on the bottom, ready to work. No need to circulate, rotate or to make hole.

Weight applied to the drill string cuts the shear pins which support the ram, driving the steel fingers through the die and bending them into a tight basket.

As the fingers curve out and interlock, they scrape the bottom of the hole, picking up and retaining *all* the junk, big and little. A clean hole in 3 minutes!

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THIS LAUGH

OFF!!

Sandy McTavish attended a celebration where the amount of good whisky was unlimited. About the middle of the evening he got up and started the rounds of the guests saying goodnight very politely. "But surely you're not going yet Sandy," the host objected.

"No, mon," said Sandy, "I'm not gaein, but I'm tellin' ye gud nicht while I still know ye."

"Barber, do you have another razor?"

"Sure. Why?"

"I'd like to defend myself."

With tears in her eyes his wife exclaimed: "I know you don't love me—you've forgotten my birthday!"

"Darling," replied the quick thinker, "I am more sorry than I can say, but it is really your fault."

"My fault!" she exclaimed. "How can that be?"

He took her hand in his. "How can I remember your birthday," he asked, "when there is never anything about you to remind me that you are a day older than you were a year ago?"

Absent-minded Professor: "Lady, what are you doing in my bed?"

She: "Well, I like your bed, I like your neighborhood and I like your house. And furthermore, it's about time you remembered that I'm your wife."

"What was that you said, Henry?" she asked as she loosened her shoulder straps. "Say it again dear." She let her dress slide to the floor. "I can hardly believe it." She stepped out of her shoes, drew up a chair and slowly pulled off her stockings. A long pause. She listened tremulously excited. "Promise me you won't tell a soul." Her ethereal silk underthings slipped down and fell in a little pool of ruffles at her feet. "All right, Henry, goodbye." She hung up the receiver.

The chorine was examining one of her old gowns. The dress was torn and in a most dilapidated condition.

"Gee," she said, "I wonder what I'll have to do for this dress?"

"My Lord," returned the girl friend, "ain't you done it yet?"

Waiter: "May I help you with that soup, sir?"

Diner: "What do you mean, help me? I don't need any help."

Waiter: "Sorry, sir. From the sound I thought you might wish to be dragged ashore."

She was the kind of a girl who wore those kind of dresses that kept everyone warm but her.

A tactful girl is one who makes a slow guy believe he's a fast worker.

When a man began boasting that he could name any brand of liquor, a friend pulled a flash from his pocket and invited him to taste the contents and tell him what it was.

He did so and promptly spit it out. "That's gasoline, you fool!"

"Yeah, I know. But what brand?"

The rich old maid had a pet mama cat which she never let out of the house at night.

Then she went on a cruise and her maid she left at home received this cable:

"Wonderful time. Met swell man. Cocktails and fun every night. Be sure to let cat out of house tonight without fail."

And then there's the story about the three bears.

Papa bear opened the door of his cupboard and said in a deep gruff voice, "Who drank my beer?"

Mama bear said in her high squeaky voice, "Who drank my beer?"

Little baby bear went "Hic!"

The Lord compensates those who aren't important by making them feel important.

"Girls, girls," sighed the sailor. "If only I could fall into their arms without falling into their hands."

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D+B Develops New Pump Accessory for Deep Well Pumping

The D+B Division of Emsco Derrick & Equipment Company has recently developed a new accessory for use on D+B Oil Well Tubing Liner Pump. The new device is known as a Plunger Hanger.

At the direct request of the United States Navy at the Elk Hills field, D+B started engineering research and designing some months ago to develop a method whereby a larger size Tubing Liner Pump could be operated on a smaller size string of tubing. Well potentials at Elk Hills were greater than anticipated and the fact that the next larger size tubing of 3" was not available created a problem. With the nation's need for more oil daily becoming more acute, D+B was commissioned by the Navy to solve the problem. The new Plunger Hanger is the result.

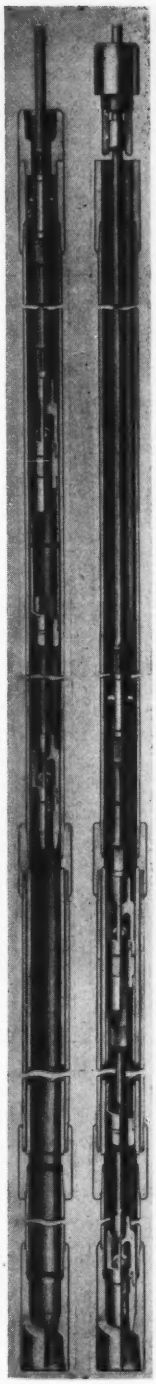
The Plunger Hanger is an inexpensive device composed of three parts—a top half with a sleeve at its lower end, which connects to the small tubing, a bottom half which connects to the upper half giving support to the sleeve, and a special sucker rod coupling with a pin protruding through the sides. The top half is threaded to make up on the tubing string used in the well. The bottom half is threaded to take the top half of the Hanger and its lower end is threaded to connect to one joint of tubing of corresponding size to the Tubing Pump used. The sleeve on the lower end of the top half into which the bottom half is threaded is machined with two inverted "J" slots to take the special sucker rod coupling. To install the Plunger Hanger one joint of tubing must be used of the same size as that of the pump to be used. For example, if a 3" tubing Liner Pump is to be run on a string of 2½" Upset Tubing, one joint of 3" Upset Range 3 Tubing is made up in the top end of the pump. On the other end of this joint of tubing the Plunger Hanger is installed. From the plunger cage of the pump the assembly consists of a short pony rod, the special coupling with the pin protruding through the sides, and one standard length of sucker rod.

At the time the pump is being lowered into the well the plunger is suspended in the joint of large tubing with the protruding pins on the sucker rod coupling located in the "J" slot. After the tubing is lowered in the well, the sucker rods are lowered and screwed on the rods already in the well. In order to start pumping it is necessary to raise the sucker rods slightly so the protruding pins of the sucker rod coupling clear the lips of the "J" slot, turn to the left a quarter turn, and then lower the plunger to the pumping position. The standing valve can be released and the pump is ready to start operation.

In pulling the pump, the plunger is lowered to pick up the standing valve in the conventional manner. Then the plunger and standing valve are raised by means of the sucker rods to completely remove the plunger and standing valve from the liner column into the upper joint of tubing. As this is done the protruding steel pins on the sucker rod coupling are guided into the "J" slot, the rods are turned a quarter to the right, and lowered to rest in the slot provided. In this position the Plunger and standing valve are hung in the joint of tubing above the pump, allowing the oil to drain around the special sucker rod coupling, plunger, and standing valve. The "J" slot then acts as a clutch in breaking the sucker rod string. After the sucker rods have been removed from the tubing, the tubing can be removed from the well. The fluid will drain through the pump permitting the tubing column to empty the oil contained in it as it is pulled. Thus the operator can pull his tubing string "dry" instead of "wet" as he has had to do in the past.

Although the basic purpose of the Plunger Hanger is to permit the use of a larger size pump on a smaller size string of tubing, the attendant advantages in its use have proved of real importance. As mentioned above, it eliminates the customer "wet" job in pulling tubing and provides a clutching action that can be obtained by using the "J" slot for tightening or breaking the sucker rods. In addition, the Plunger Hanger eliminates wear and tear on the plunger as it is not necessary to lower it through the tubing. For this reason, some operators already favor the use of the Plunger Hanger with a pump using normal size tubing.

The D+B Plunger Hanger is positive in its operation and installations to date have not only proved its practicability but have been a subject of great interest to oil operators everywhere.



A B

PHOTO A

This photograph shows the Plunger Hanger made up with a D+B Tubing Liner Pump, with the plunger and standing valve removed from the liner column and suspended in the joint of large tubing immediately above. The protruding pins on the special sucker rod coupling are located in the "J" slot in the lower end of the top half of the Hanger. This position of the plunger and standing valve permits the oil to drain around the special sucker rod coupling, plunger and standing valve.

PHOTO B

This photograph displays the position of the Plunger Hanger while the pump is in operation. For purposes of illustration, the top half of the Plunger Hanger is shown separated from the lower half. Note that the standing valve has been released and the plunger is in normal pumping position.

BUY WAR BONDS

A Western Gear Works' Pumping Unit on a Buena Park well.

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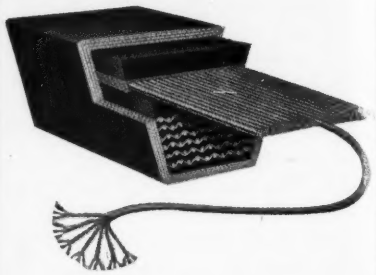

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Public Hearing on L.P.G. Safety Orders

Paul Scharrenberg, Chairman California Industrial Accident Commission, has announced public hearings on proposed revisions to the Liquefied Petroleum Gases Safety Orders. One hearing will be held in San Francisco on April 26, at 10:00 AM in Room 160 of the State Building. Another hearing will be held in Los Angeles on April 30, at 10:00 AM in the auditorium of the State Building.

Douglass Balthis Passes Away

Death, following a heart attack on March 17th of B. Douglass Balthis, 47, President of Natural Gas Equipment, Inc., removes another well known figure in the field of industry and civic life in Southern California.

1898—1945

The company, of which Mr. Balthis was an officer, was organized from a former partnership in 1924 when he became identified in the leadership of the corporation, which manufactures gas appliance equipment for the oil fields and allied industries.

A brother, Frank S. Balthis, Jr., is District Director of the Office of Price Administration and a son, 1st Lieutenant Douglass Balthis, Jr. is serving in Italy with the Air Force as pilot of a P-38.

Death occurred at the family residence, 1536 Bel Air Drive, Glendale, California on the night of March 17. Deceased was a native of Huntsville, Miss., and attended high school at Glendale and Stanford University. In World War I he served as a member of the famous Rainbow Division.

Mr. Balthis is survived by his wife, Esther Sinclair Balthis; a daughter, Mrs. Barbara Balthis Fitzpatrick and a brother, William Balthis, police commissioner of Maui, T. H., and an officer of the Bank of Hawaii, and his brother in Los Angeles and son in active service, mentioned above.

Deceased was a member of Unit 368, Lodge F. & A. M.; the University Club of Los Angeles, of the National Petroleum Institute and Pacific Coast Gas Association.

Funeral services were held in the Wee Kirk o' the Heather, Forest Lawn, the morning of Tuesday, March 20.

American Association of Petroleum Geologists—Pacific Section

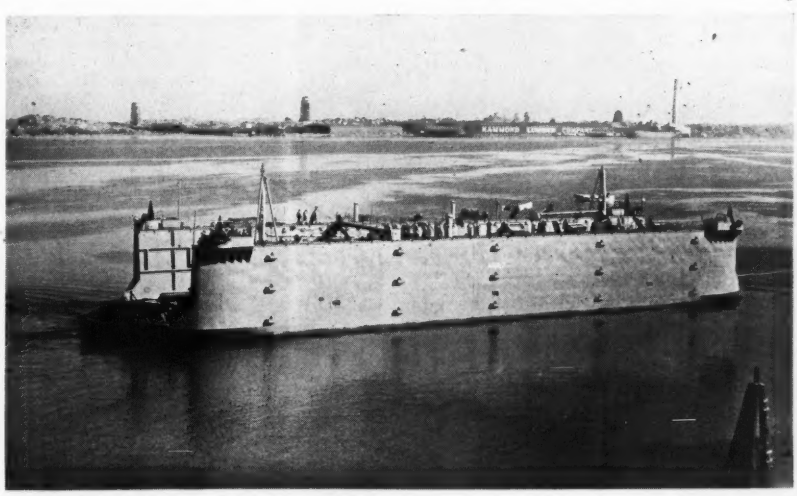
Speaking before the Pacific Section of the American Association of Petroleum Geologists on March 23 at the University Club in Los Angeles, Dr. James Gilluly, Professor of Geology at the University of California at Los Angeles, discussed the manner in which a group of civilian geologists and soil specialists aided in solving some of the many engineering problems which confronted the United States military command during operations in the Southwest Pacific.

Being assigned to this work by the United States Geological Survey at the request of the U. S. Army, Dr. Gilluly described the duties and problems of these geologists concerning questions on what he termed "Engineer Intelligence".

In view of the very slight knowledge of the country in which military operations were planned, said Dr. Gilluly, it was necessary to interpret such maps and aerial photos as were obtainable and to describe this data in terms of the ground features which would be encountered by the troops in action. In addition it was necessary to select landing beaches, routes inland, airfield sites and the always important water supply points.

As plans for the invasion of the Philippines developed it became evident that even larger engineering problems were to be confronted, continued Dr. Gilluly. Three geologists were assigned to accompany the Army Engineer troops at an early stage in this operation in order to be on hand for consultation on construction problems. Dr. Gilluly was one of the geologists assigned to this latter group and his discussion of the problems and experiences encountered in this early stage of operations was exceedingly interesting.

Dr. Gilluly spent 8 months in the Southwest Pacific and has already returned to resume his duties at the University of California at Los Angeles. He has been associated with the United States Geological Survey since 1921.



Floating steel dry dock built for the Navy by the Chicago Bridge & Iron Company at its Eureka, Calif., yard. Dry docks of this type "follow the fleet," making it possible to repair ships and get them back into action without bringing them long distances to repair yards.

Field Development

PREPARED BY CALIFORNIA OIL WORLD NEWS SERVICE

Los Angeles Basin

Covina Ventures Drilling Ahead

Continental Oil Co. continues to drill ahead below 3350 ft. in Bayly No. 1, sec. 29-1s-9w in the San Jose Hills area near the citrus growing community of Covina. Volcanics topped at 2643 ft. have persisted to present depth.

West of the Bayly venture on sec. 30-1s-9w, Ohio Oil Co. is preparing to carry LeGrand No. 1 ahead from 5112 ft., after completing fishing job, which delayed normal operations for several days.

Athens Test Stands Idle

Johnson No. 1 deep test, sponsored by General Exploration Co., of Calif., west of the Athens field on sec. 11-3s-14w, suspended operations at 8944 ft. when showings of commercial worth were absent to bottom. The well is apparently low on structure, and it may be that operator will decide to plug back and redrill.

Imperial County Project Resumes

After making no new hole for a number of weeks, Amerada Petroleum Corp. is preparing to prospect on down in Veysey No. 1, sec. 9-16s-16e, in the Brawley area, from present depth of 5118 ft. On sec. 8 near Holtville, The Texas Co. Grupe-Engebretson No. 1 test is washing over drill pipe at 2668 ft. Bottom is 9014 ft.

New Life At Costa Mesa

In the early stage are three new Costa Mesa drilling jobs. Barnhart-Morrow Consolidated has location graded for Deeble No. 1, some 200 ft. north and 2200 ft. east from the south quarter corner sec. 18-6s-10w Delaney Petroleum Corp. and John McLeod in a combination of interests are rigging McCain No. 1 on sec. 17. Emil Menvig has foundation poured for Menvig No. 1 on sec. 21.

The O. F. Darling No. 1 on sec. 23, was last reported bailing sand from 1904 ft. Indications are liner will be pulled and the hole carried deeper from present bottom. Macoil Co. Townsend No. 3 on sec. 21 is deepening from 6137 ft., after 10¾ in. protection string was set at 940 ft.

Seaboard Adds L. A. City Corehole

As an added preliminary before launching a standard sized well a few miles from downtown Los Angeles near Chavez ravine in the Elysian Park area, Seaboard Oil Corp. plans a fifth corehole. Location falls not far from the intersection of Avenue 26 and Lacey street.

Dumm Petroleum Corp. has rig up for Olympic No. 15 in the Lincoln Park area of Los Angeles near the old Ascot speedway. Actual

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	Gen. Expl. Co. of Calif., Johnson	1	11, 3-14	8944	Prep. to redrill
Aliso Canyon	Standard Oil Co., Ward	3-1	27, 3-16	8981	Drilling
	Standard Oil Co., Wigdal	1	19, 3-16		Location
Del Valle	The Texas Co., Kern	1	18, 4-17	1683	Drilling
Gardena	Ohio Oil Co., Gardena Comm.	1	25, 3-14		Rig
La Habra	Assoc. Piping & Eng. Co., Simmons	1	1, 3-11	5464	Abandoned
Las Llajas	Standard Oil Co., Brady Est.	2-1A		2524	Drilling
Lincoln Park	Dumm Bros. Pet. Corp., Olympic	15	24, 1-13		Rig
Newhall	Anderson, J. I., Tomato Can	1	11, 3-16	4726	Idle
	British-Am. & The Texas Co., NLF	2	21, 4-17		Foundation
	C.C.M.O. Co., Sanborn	1	6, 3-16	7327	Rigging up
Oak Canyon	Western Gulf Oil Co., Stevens	B-1	5, 4-17	843	Drilling
Pico Canyon	Standard Oil Co., Pico C. O.	42	1, 3-17	7680	Drilling
Pomona	Jones, Everett, Well	1	17, 2-9	795	Idle
San Jose Hills	Continental Oil Co., Bayley	1	29, 1-9	3326	Drilling
	Ohio Oil Co., Legrand	1	30, 1-9	5112	Drilling
Turnbull Canyon	Capital Co., Capital	1-2	12, 2-11	1503	Idle
W. Coyote	Pike Drlg. Co., Bolsa-Stern	1	14, 3-11		Rigging up
	Standard Oil Co., Lewis	1	11, 3-11		Prep. to spud
	Imperial County				
Brawley	Amerada Pet. Corp., Veysey	1	9, 13-13	5118	Cleaning out
Holtville	The Texas Co., Grupe-Engebretsen	1	8, 16-16	9014	Fishing
	Orange County				
Brea Canyon	Seacoast Oil Co., Wardmann-Comm.	1	3, 3-10	5824	Abandoned
Buena Park	Gen. Pet. Corp., Librown	1	21, 3-11		Rigging up
	Gen. Pet. Corp., Heath	2	34, 3-11	12088	Abandoned
Costa Mesa	Barnhart-Morrow Deeble	1	18, 6-10		Rig
	Darling, O. F., Darling	1	23, 6-10	1904	Prep. to deep.
	Delaney & McLeod	1	17, 6-10		Rig
	Macoil Co., Townsend	3	21, 6-10	6134	Redrilling
	Menvig, Emil L., Well	1	21, 6-10		Foundation
Huntington Bch	Atha Expl. Co., Newland	12-3	12, 6-11	3708	Drilling
Kraemer	Mid. Cal. Pet. Co., Mid. Pet.	K-1	24, 3-9	2512	Fishing d.p.
Yorba Linda	Skylark Mfg. Co., Howe	1	22, 3-9	1477	Drilling
	San Bernardino County				
Chino Hills	Chino Hills Oil Co., Kraemer	2	33, 3-28	1366	Idle

drilling start is understood awaiting clarification of certain aspects of the municipal zoning ordinance.

Plan Chatsworth Slim Hole

Shell Oil Co., Inc., is preparing to start the drill in Davey No. 1 corehole in the Chatsworth area on sec. 25-2n-17w, Los Angeles County. This is about 1800 ft. northwest of Schonfeld No. 1 wildcat, recently drilled by the company to 5162 ft. and abandoned.

The corehole is primarily designed as a geological informant, which will be the factor largely determining whether further full scale wildcat operations in the area are justified.

Del Valle Well Flows

Standard of California's recent completion, Sepulveda No. 9, in the Del Valle field, currently flows 613 barrels of 34.1 gravity oil and 458 mcf gas a day through a one-quarter inch orifice from a total depth of 5758 ft.

The company's Brady Estate No. 2-1A in the Las Llajas area has reached 2550 ft. Lewis Comm. No. 1 in the Leffingwell area between West Coyote and Santa Fe Springs is awaiting drilling crew.

Aliso Canyon Test Preparing

In wildcat country northeast of the Aliso Canyon field on plunge of the Pico anticline, the Seaboard Oil Company-Honolulu Oil Corporation combination will drill Mission No. 1 near the southeast corner of sec. 23-3n-16w. About one mile south Shell Oil Co. carried Mission No. 2-1 to 6978 ft. for an unsuccessful quest for commercial oil, three years ago. Oil showings were logged at a number of intervals, however, the best of which between 1730 and 2160 and 6550 and 6600 ft.

West Coyote Test Rigging

A triumvirate, composed of Thomas P. Pike Drilling Co., Bolsa Chica and British-American, is rigging to begin drilling operations in Stearns No. 1 wildcat, west of the West Coyote field on a lease block embracing approximately 700 acres, some distance from the exploratory project drilled three years ago by The Texas Co. on the McNally ranch. The well will go down on sec. 14-3s-11w.

Dominguez Well Below 12,000 Ft.

Shell Oil Co., Reyes No. 135 deep try of the Dominguez field is making headway below 12,000 ft. in sand and shale. Interest in the project is shared with Union Oil Co., actual driller.

Union Oil Co. Callender No. 46, is deepening at 5585 ft. to take in more of the 5th zone, a formation previously exploited to an extent and the source of production formerly established. Hellman No. 55, a scheduled developer of 1st and 2nd Callender zone, is making hole at 4200 ft.

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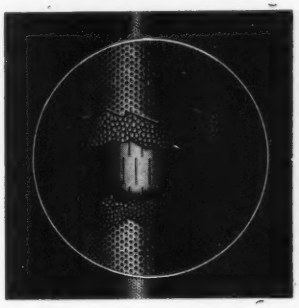

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Coastal and Northern District

Rincon Field Adds Producer

Beloil Corp., Ltd. Hobson State No. 52-1 on sec. 17-3-24 completed flowing at a daily rate of 324 barrels of 30.6 gravity oil from 4135 ft. Chanslor-Canfield Midway deep test in the same section is drilling slightly below 7800 ft. General Petroleum Corp. has carried Ferguson No. 9 on sec. 7 to 1993 feet, and Richfield Oil Corp., Hobson State No. F-4 on sec. 8 is still only a location.

Shiells Canyon Trio Operating

Los Nietos Co. is drilling Elkins No. 2-9 on sec. 5-3-19 in the Shiells Canyon field at 2311 ft. A. Oberholtz, Operator, has carried No. C-10-1 on sec. 10 to 5900 ft., and The Texas Co., No. 6 on sec. 5 is down 1206 ft., but troubled with circulation.

San Benito Co. Test Suspended

San Benito Oil Co. Friis Regan No. 1 on sec. 10-13s-5e in the Hollister area of San Benito County suspended operations at 4435 ft. The well, located on Hill Lot 48 of Ranch San Justo, found slight showings of oil and gas around 3000 ft.

It is interesting to note that geology in areas prospected in the county in most instances is excellent, but fails to prove out when explored by the drill.

Shell Finishes Solano Co. Gasser

Shell Oil Co., Inc., completed its second well in the Kirby Hills of Solano County, opened up by the company some weeks ago on the north shore of the marsh lands of San Francisco Bay region. The new producer, Lambie No. 2 on sec. 30-4n-1e, on test flowed at the rate of 10,740 mcf a day from two perforated intervals above 3228 ft. Lambie No. 3 on sec. 25, is standing with surface casing cemented at 522 ft.

The new gas area lies 20 miles northeast of Shell's Martinez refinery and 10 miles from the Shell Point plant of Shell Chemical.

Knoxville Sand Effort Produces

Bel-Air Oil Co.'s Giacomini No. 2 on sec. 24-1-35, a Knoxville sand production effort, finished for 187 barrels of 16.8 gravity crude oil daily from 5442 ft. Top of Knoxville sand, 4602 ft.

Amerada Corp. Reaching Out

Four miles west of its Starkey Fee No. 1 gas producer, Amerada Petroleum Corp. will drill Atkinson No. 1 on sec. 10-7n-2e, Solano County, where it recently discovered the Millar and Maine Perry gas fields. Three and one-half miles east of the Wineman No. 1 on sec. 26-6-23, the company is rigging Comber No. 1 on sec. 19-6n-2e. The Wineman well was shut in after establishing a potential of 19,000 mcf of gas.

Union Completes Bardsdale Well

In the Dryden area of the Bardsdale field, Union Oil Co. has completed Dryden No. 11 at 3010 ft. for 150 barrels of 29.7 gravity oil a day.

The company is preparing to drill Wheat No. 4 and No. 5 in the northwest part of the Santa Maria field. They will go down on the same lease, on which Wheat No. 3, a deepening job to the Knoxville sand was recently finished for an excellent production rate.

Tar Springs Test Drilling Deeper

Amerada Petroleum Corp., Tar Springs Ranch No. 1 wildcat, Huasna Valley, San Luis Obispo County, continues to drill in sand and shale at 5223 ft., without reported showings of oil or gas. Rocky Mountain Drilling Co. is the driller.

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Santa Barbara County					
Bradley Canyon	Union Oil Co., Fugler	1	3, 9-33		Foundation
Buellton	Richfield Oil Corp., Skytt	1	4, 6-32	1450	Drilling
Cat Canyon	Krieger Oil Co., Los Flores	1	27, 9-33		Material
Gaviota	Standard Oil Co., Hollister	1	35, 5-33		Rig
Los Alamos	Bel-Air Oil Co., Price	1	21, 8-32	3952	Drilling
Los Olivos	Hub Oil Co., La Laguna	1	7, 7-30	5036	Drilling
Ventura County					
Camarillo	Barth, D. A., Well	1	32, 2-20	520	Idle
Fillmore	Standard Oil Co., Elkins	1	6, 3-19	5749	Drilling
Ojai	Delaney Pet. Corp., Victory	1	8, 4-21	1985	Drilling
	Volunteer Pet. Corp., Hilltop	2	7, 4-21	2053	Drilling
	Volunteer Pet. Corp., M & L	1	7, 4-21	245	Idle
Owensmouth	T.W.A.O. Co., Triunfo	1	12, 1-18		Foundation
Oxnard	Lloyd Corp., Ltd., Todd	A-1	6, 1-22	4211	Rig pump
	MacDonald, Burns & Norris, Culbertson	1	12, 1-22	4344	Abandoned
Santa Paula	Standard Oil Co., Santa Paula	1	10, 4-20	775	Drilling
Snowball Anticline	Grubb & Hawkins Snowball	1	19, 4-24	2802	Prep. to deep.
Timber Canyon	Hickey Noble J., Temple	1	22, 4-21	775	Idle
San Luis Obispo County					
Tar Springs	Amerada Pet. Corp., Tar Springs	1	25, 31-14	5223	Drilling

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Contra Costa	Ardly Pet. Co., Almond	1	3, 2n-2w	40	Drilling
	Shell Oil Co., East Bay	1	13, 1n-3w	6331	Drilling
Sacramento	The Texas Co., Walnut Grove	1	35, 5n-4e		Location
San Benito	Panoche Pet. Co., Panoche	2	24, 16s-10e	160	Idle
	San Benito Oil Co., Fries Regan	1	4, 13s-5e	4277	Idle
San Joaquin	Honolulu Oil Corp., Brack	B-1	29, 3n-6e	5004	Abandoned
Solano	Amerada Pet. Corp., Atkinson	1	10, 7n-2e		Rigging up
	Amerada Pet. Corp., Comber	1	19, 6n-2e		Rigging up
	Amerada Pet. Corp., Wineman	1	26, 6n-2e	5000	Shut in
	Shell Oil Co., Lambie	2	30, 4n-1e	3228	Completed
	Shell Oil Co., Lambie	3	25, 4n-1w	522	Drilling
	Standard Oil Co., Suisun	6	5, 3n-1w		Rigging up
	The Texas Co., Winchester	8-1	4, 6n-4e	3774	Drilling
Sonoma	Gregory, Leonard A., Bettinelli	1	29, 5n-6w		Location
Sutter	Buttes Oilfields, Inc., Buttes-Ward	1	2, 15n-1e	6500	No report
Yolo	The Texas Co., Salisbury	1	20, 10n-1e	6214	Drilling

Santa Paula "Cat" Still Shallow

Difficulty in retaining circulation has slowed drilling operations in the Standard Oil Co., Santa Paula Unit No. 1 on sec. 10-4-20 in the San Cayetana mountain area. Depth last reported was 774 ft.

Los Olivos Try Gets Shutoff

On the east edge of Los Alamos Valley in the Los Olivos area, Hub Oil Co. is drilling La Laguna No. 1 wildcat at 5040 ft., after getting water shutoff at 4625 ft. Situated on sec. 7-7n-30w, top of Monterey was placed in the well at 3000, Miocene, 3378 and oil showings, 4625 ft.

Drilling Proceeds In Buellton Venture

West of Buellton on a large block of leases, Richfield Oil Corp. is drilling Skytt No. 1 on sec. 4-6n-32w at 1450 ft. Surface string is set at 366 ft. The company's holdings embrace more than 6000 acres between Buellton and Lompoc, mainly on the Rancho Santa Rosa and adjacent and Santa Carlos de Jonata. It is designed as a Miocene trial.

Two Wells Drilling Deeper At Ojai Area

Volunteer Petroleum Corp., Hilltop No. 2 on sec. 7-4n-21w in the Ojai area of Ventura County is making steady progress at 2053 ft. in blue silty sand with oil showing. On sec. 8, Delaney Petroleum Corp. is deepening Victory No. 1 at 1985 ft. from former depth of 1640 ft.

Santa Paula Creek Well Drills Ahead

Oscar J. Smith is drilling his Analuf No. 7 well on sec. 21-4n-21w in the Santa Paula Creek field, Ventura County, at 575 ft.

South Mountain Well Pump Tests

British-American Oil Producing Co.'s most recent pump trial of its Richardson Ranch No. 1 on sec. 13-3n-21w is reported to have shown mostly water with only an oil trace. Total depth is 4485 ft., with plug at 4080 and 2½ tubing hung at 4000 ft. On sec. 19, F. E. Fairfield is fishing froze drill pipe in his No. 3 well. Bottom is 3116 ft.

Wheeler Ridge Test Given Up

With some oil stained sand the sole evidence of petroleum in drilling and coring Conoco-KCL K-1 on sec. 36-11-20 to a depth of 6160 ft, in gray sand, Continental Oil Co. decided to call it quits at this location.

Race Track Try Makes Headway

Kern Oil Co., Ltd., No. 34-28 on sec. 34-29s-29e has reached 1450 ft. in sand and shale. Recovery from cored interval of 1360-80 ft. was reported very poor.

Barnsdall Deep Try Testing

Continuing with cementing jobs in R. S. F. No. 44 in the Newhall-Potrero field, Barnsdall Oil Co. was last reported securing water shutoff above and below the 6th zone, topped at 9670 ft. A series of formation tests already have been run in the well, but are considered of little practical value in determining the potential productive capacity of the deep explorer.

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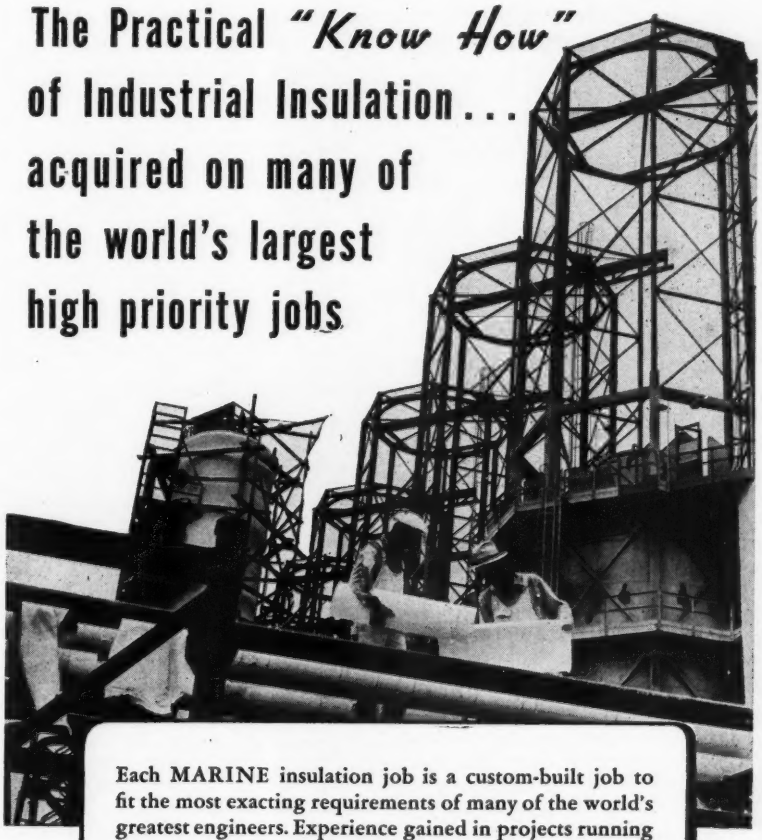

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San Joaquin Valley

Richfield Starts Two New Wildcats

Richfield Oil Corp. has announced locations for two new wildcat drilling projects in Kern County. On a block of 1000 acres leased from the Di Giorgio Fruit Co., the company will drill Di Giorgio Three No. 1 on sec. 3-31s-29e, southeast of the Mountain View field and northeast from the Arvin field. It is designed to test deep. Three miles northwest of the Wheeler Ridge field the company has made location for KCL-Wildflower No. 1, sec, 12-10n-20w. This well is objectively directed to at least 5000 ft. As soon as drilling crews and tools are available work will start in the wells.

Mountain View Test Flowing

J. I. Listle, Canfield No. 1, on sec. 13-30-28, was completed, flowing 120 barrels 22 gravity crude oil in six hours, cutting slightly through a one-quarter inch orifice. Depth is 5222 ft., with seven-inch casing cemented at 5170 ft., and gun-perforated in the interval of 4980-95 ft. Current production is 150 barrels daily of 22.1 gravity oil.

Plan Workover of Trice Prospect

Happold-Amalgamated No. 2 on sec. 15-25-24, southeast of the Trico gas field, has been acquired by Grubb and Hawkins, who are rigging up to perforate and test. The first interval to undergo trial will be from 9970 to 10,030 ft. The well was drilled by Harry H. Magee, Operator, to 11,220 ft. and cemented seven-inch casing at 10,200 ft. A number of inconclusive tests were made of the Olcese and Vedder zones. Two large operating organizations are reported planning drilling jobs northwest and southeast of the well.

Jasmine Scene of Another Wildcat

Rothschild Oil Co. will drill J. O. L. No. 1, a wildcat well, located in the Jasmine area 330 ft. north and 990 ft. west from southeast corner of sec. 23-25-27. In the Kern River area, the company went to 4811 ft. in Trust No. 81 on sec. 13-29-28, without important showings and quit.

Cantua Creek "Cat" Drills

Approximately 20 miles north of Coalinga, Tide Water Associated Oil Co. is drilling S. P. No. 82-15 on sec. 15-17s-15e steadily ahead at 9900 ft.

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
	Fresno County				
Cantua	Tide Water Assoc. Oil Co., S. P.	82-15	15, 17-15	9940	Drilling
Jacalitos	Jacalitos Oil Co., Well	1	30, 21-16		Location
San Joaquin	Standard Oil Co., Griffen	74-18	18, 16-16		Rigging up
	Kern County				
Antelope Hills	Hernstadt, Wm. L., Well	1	24, 27-19		Location
	Mohawk Pet. Corp., Layman	1-18	18, 28-20		Rigging up
Canal	The Texas Co., KCL	77-32	32, 29-25	9466	Coring
Canfield Ranch	Tide Water Assoc. Oil Co., KCL	82-22	22, 30-26	7825	Testing
Devils Den	C.C.M.O. Co., Bates	2	20, 25-19	7392	Drilling
Edison	Lumpkin-Taylor & Assoc., Well	1	16, 30-29		Location
	Richfield Oil Corp., Cauley	43-16	16, 30-29		Grade
	Richfield Oil Corp., Lawson-Bennett	1	26, 30-29		Grade
Fairfax	Richfield Oil Corp., Smith	57-1	1, 30-28	3699	Drilling
Fruitvale	General Pet. Corp., Kernlandia	84-16	16, 29-27	8117	Abandoned
Gosford	T.W.A.O. Co., KCL	22-23	23, 30-26		Grade
Gould Hills	Hilo Oil Co., Hilo-Atlas	1	8, 29-21	6010	Suspended
Kern Front	Richfield Oil Corp., Hood-Bloemer	2	26, 28-27	2322	Drilling
Kern River	Rothschild Oil Co., Trust	81	13, 29-28	4811	Abandoned
	Wilkern Oil Co., Neebeeker-Landers	1	17, 28-29	982	Idle
Lost Hills	Standard Oil Co., Cahn	58	4, 27-21	8049	Drilling
McKittrick	Americal Pet. Corp., Americal	1	2, 30-31	5450	Idle
	MacDonald, Burns & Norris, Flickinger	2	36, 30-22	5488	Logging
	Standard Oil Co., McPhee	2-1	36, 29-21	7665	Testing
	T.W.A.O. Co., Well	64-34	34, 30-22		Rigging up
McVan	Trico Oil and Gas Co., Keating	3	20, 27-27	2149	Testing
Magunden	Western Gulf Oil Co., Bloemer	1	3, 30-28	6025	Abandoned
Mojave	Thos. M. Blake, Cinco	1	22, 31-37	1185	Drilling
Mt. Poso	Tavis, J. J. & Assoc., Well	3	8, 27-28		Location
Mt. View	J. I. Listle Canfield	1	12, 30-28	5222	Completed
	Gene Reid Drlg. Co., Porter-Day	1	29, 30-29		Location
N. Edison	Standard Oil Co., Well	45-21	21, 29-29		Rig
N. Midway	Sunset Oil Co., Sunset	1A	6, 31-23		Rigged up-Idle
Paloma	Superior Oil Co., Houchin	27-27	27, 31-26		Grade
	Western Gulf Oil Co., L.A. Club	67-6	6, 32-27	11116	Drilling
Premier	Richfield Oil Corp., Lerdo	1	1, 28-26	2910	Drilling
	Standard Oil Co., Well	34-5	5, 28-27	6570	Drilling
Race Track Hill	Kern Oil Co., Ltd., Well	28-34	34, 29-29	1290	Drilling
Round Mt.	Gen. Pet. Corp., Bishop	2	14, 28-28		Rigging up
	Hilo Oil Co., Hilo-Bishop-Swan	1	15, 28-28	2727	Completed
Saco	Gen. Pet. Corp., Kernway	1-44	1, 29-26	5050	Idle
	Gen. Pet. Corp., Kernway	64-1	1, 29-26	4000	Drilling
Shark Tooth	United Oil Co., S. P.	1	35, 28-28	3141	Idle
Sheep Springs	Independent Expl. Co., Well	76-A	17, 29-21	3618	Drilling
	Rothschild-Bender Oil Ops., Anderson	3	20, 29-21	4290	Abandoned
	Trico Oil & Gas Co., Trico	24-2	24, 29-21		Rig
So. Belridge	Bandini Pet. Co., Bacon	1	27, 28-20	10495	Idle
Stockdale	Continental Oil Co., Stockdale	1	9, 30-27		Foundation
Tejon	Continental Oil Co., Conoco KCL-K	1	36, 11-20	6160	Abandoned
	Richfield Oil Corp., Evans	1	36, 12-19	4962	Drilling
	Tejon Oil Co., Tejon	1A	19, 11-19	6475	Coring
Weed Patch	Gen. Pet. Corp., Kernsummer	8-27	27, 30-28	6235	Drilling
W. Mt. View	Richfield Oil Corp., W. Mt. View	A-26-15	15, 30-28	3416	Drilling
	Kings County				
Pyramid Hills	Pyramid Prod. Co., Spreckles	1	16, 24-18	4214	Idle
Reef Ridge	Shell Oil Co., Crow	41-2	2, 23-16	6499	Drilling
Tulare Lake	Magee, H. H., Von Glahn	17-1	17, 23-22		Rig
	Madera County				
Madera	Lytle, Lowery R., Burkhart-Greer	1	31, 12-16	331	Re-rigging
	San Luis Obispo County				
Cholame	K & M Drilling Co., Kosanke	1	17, 25-16	710	Idle
Cuyama Co.	Norris, Halvern L., Cuyama	1	25, 11-18	617	Drilling
Midway	Richfield Oil Corp., Temblor Hills	1-1	36, 31-21	8158	Rerigging
Shandon	Tutin & Twisselmann, White	1	5, 26-15	3361	Idle
Temblor Hills	Richfield Oil Corp., & Sun Oil Co., Gonyer Unit	1	36, 12-25		Rigging up
	Tulare County				
Sunnyvale	Shell Oil Co., Parsons	36-1	1, 23-25		Cellar

in hard shale. An interesting zone was reported encountered around 9500 ft.

Jacalitos Well Good Completion

Flowing initially 501 barrels of 34.9 gravity oil a day together with 160 mcf of gas, Standard of California has completed its No. 41-21E on sec. 21-21-15 from 4070 ft. Shutoff is 3553 ft.

Wilshire Oil Co., No. 67-26 on sec. 26 is being redrilled at 4365 ft. It was originally abandoned at 4520 ft.

Newcomer To Mojave Area

Location has been staked by T. L. and P. H. Park Oil Co. for Dove No. 1 well 592 ft. south and 672 east from the northwest corner of sec. 25-31s-37e in the Mojave area of Kern County.

On Sec. 22, Thomas H. Blake, Cinco No. 1 is making hole below 1200 ft. Extremely cold weather and mechanical difficulties have not been conducive to rapid operations in the wildcat.

Lost Hills Job Now Fishing

Standard of California Cahn No. 58-4 deep test on sec. 4-27s-21e in the Lost Hills area has reached a depth of 8002 ft., but last reported confronted with a fishing job. Originally designed to prospect to great depth, barring mechanical limitations it may go as far as 17,000 ft.

Fuller Starts Maricopa Try

Fuller Petroleum Co. is preparing to drill an exploratory hole in sec. 33-32s-24e, north of Maricopa and less than a mile west of the old Lakeview gusher. Western Gulf has staked location for Woodward-U.S. L. No. 1, a wildcat, 330 ft. south and 300 ft. east from the west quarter corner of sec. 23-11-23, two, and a half miles southeast of Maricopa.

Salt Lake Well Tests Shutoff

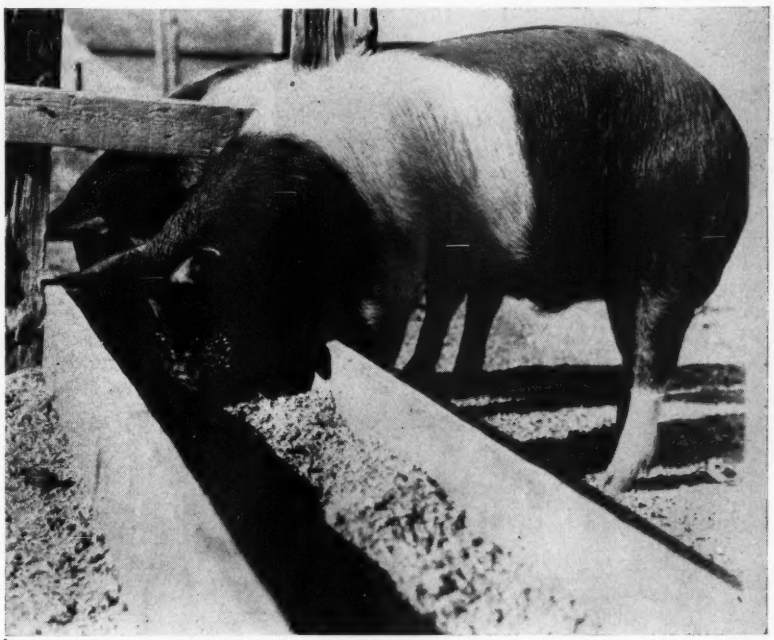
Drilled and cored to 3618 ft. Independent Exploration Co., No. 76-A in the Salt Creek area on sec. 17-29-21 is testing water shut off on pipe set at 3567 ft. Carnerous oil sand was topped at 3570 ft. The company is preparing to deepen No. 66, nearby.

Hilo Chalks Up Valley Discovery

Hilo Oil Co. chalked up a new discovery in the Round Mountain area by completing Hilo-Bishop-Swan No. 1, wildcat test on sec. 15-28-28, pumping an estimated 180 barrels of 14 gravity oil a day. Total depth is 2729 ft. with seven-inch cemented on top of the Vedder zone at 2712 ft. Settled production rate is 75 barrels daily.

Magee Sponsors Lake Wildcat

Tulare Lake apparently has suffered little from diminution of prospect interest, despite the commercial



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failure of a number of previous explorers. The most recent entrant to the area is Harry H. Magee, Operator, who has location staked for Von Glahn No. 17-1 on the center of the southwest quarter of sec. 17-23-22. This is about two miles southwest of the Elmer C. Von Glahn No. 1 on Sec. 4, same township, which was drilled to 9731 ft. to a bottom in gray sand and abandoned. Although a number of gas and oil showings were encountered at various depths, they were not of sufficient merit to promise a producer at that location.

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Devils Den Well Going On Down

Chanslor-Canfield-Midway Oil Co., Bates No. 2 in sec. 20-25-19, which has had the toughest kind of formation to penetrate for the last several hundred feet of hole, is making progress at 7385 ft. in hard gray sand. A core taken around 7350 ft. was hard fine-grained sand. Hard sand top was placed at 6782 ft.

Midway-Sunset Scores Two

Long Beach Dock and Terminal Co. has completed its Bronco No. 2 well on the old Otis Hoyt property, one mile east of Maricopa, for 15 barrels of 20 gravity oil a day at plugged depth of 2335 ft. Site is on sec. 8-11n-23w.

Thomas P. Pike, Operator, completed Pyramid No. 8 on sec. 28-32s-24e at 3404 ft. It was last reported making 240 barrels of 25 gravity oil daily.

Coalinga Eocene Test Getting Deep

The Pauley brothers Crandall No. 42-18 on sec. 18-19s-16e at the flank of Coalinga Eocene production is making headway in sand streaked with siltstone at 8200 ft. Gas sand was topped at 8056 ft.

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